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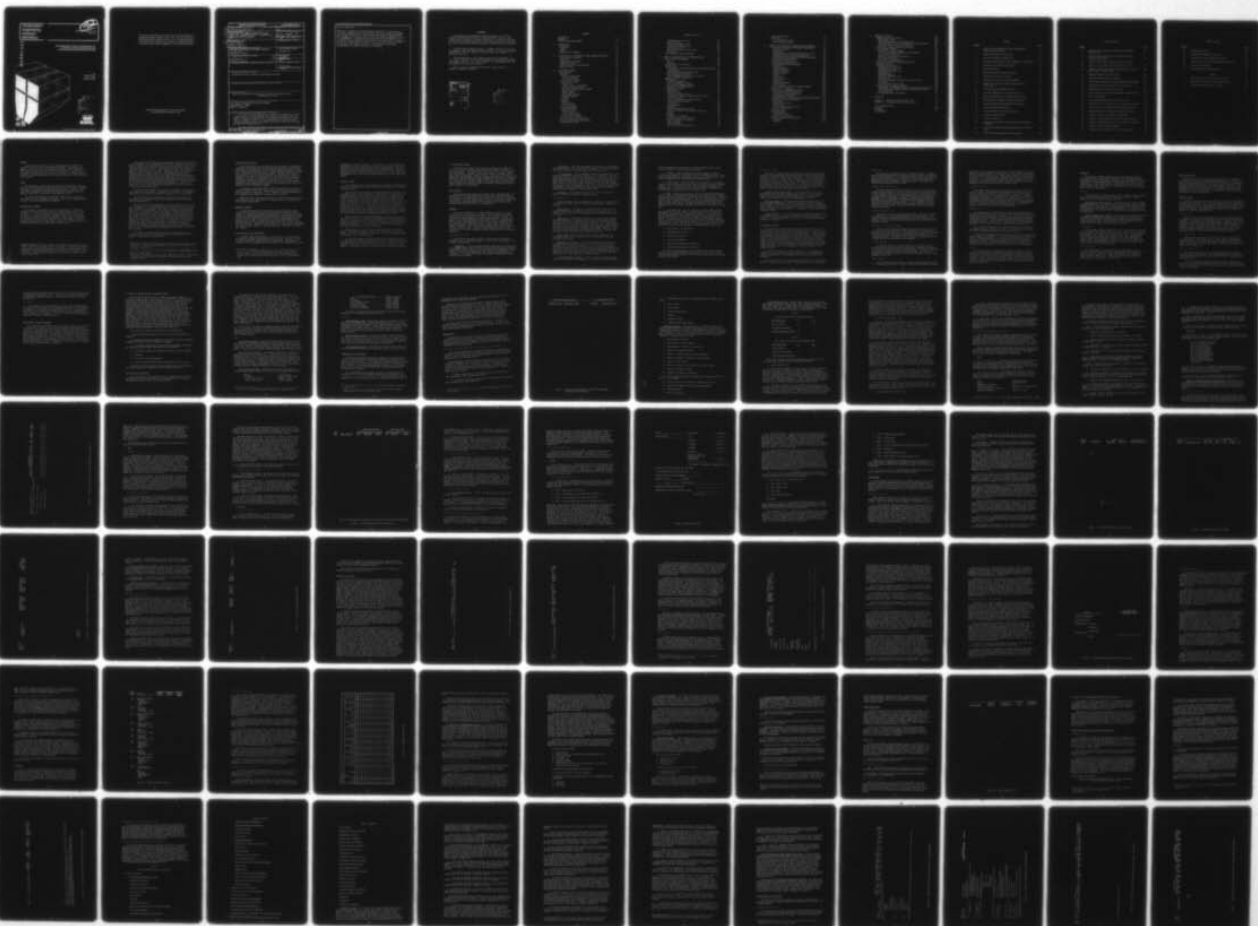
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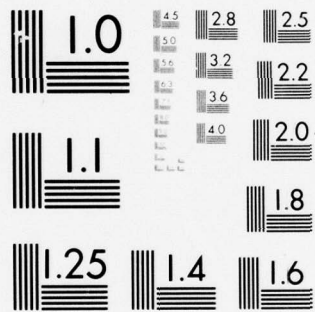
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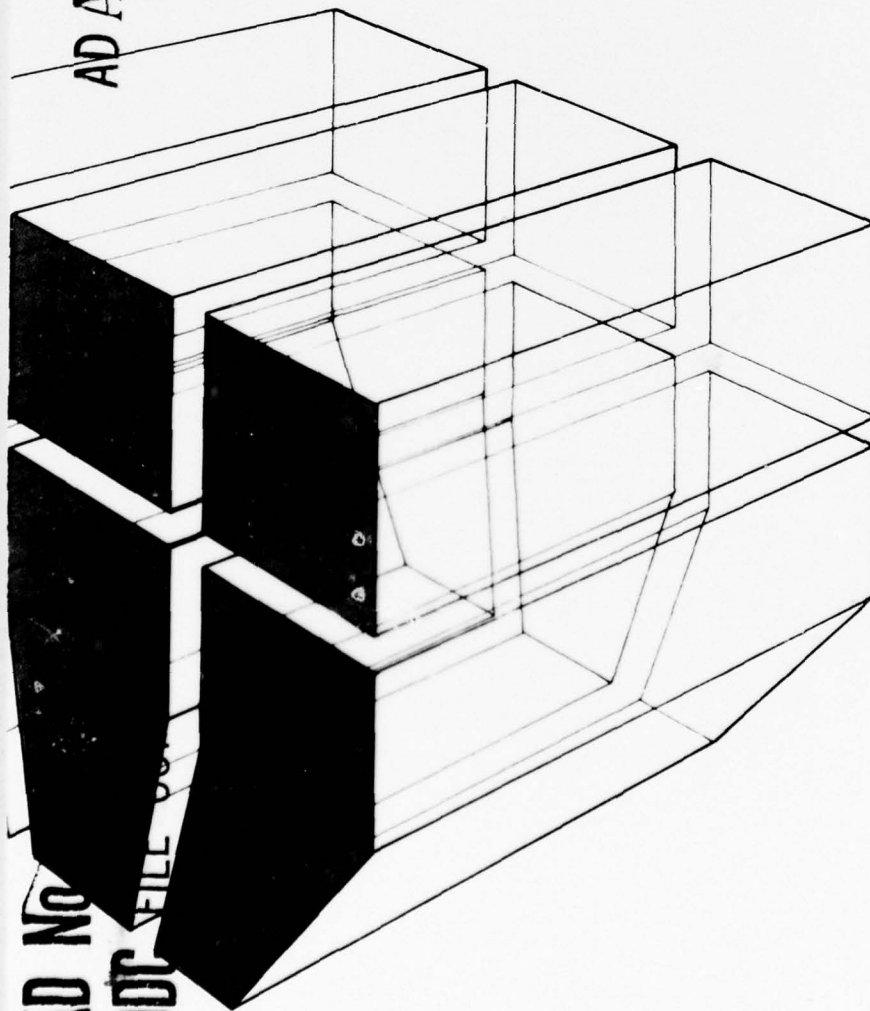


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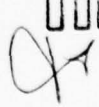
  
TECHNICAL REPORT C-73  
June 1977

CONSOLIDATION OF RPMA AT FAYETTEVILLE, NC  
VOLUME IV: GENERAL PROCEDURES FOR  
CONDUCTING RPMA CONSOLIDATION STUDIES

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by  
David W. Brown  
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Block 20 (continued) *for p1473A*

necessary to compare the current method of operation of the existing facilities engineering organizations with that of the proposed Army RPMA consolidated organization. The procedures are based on the assumption that the Army is the lead service for the consolidation and Army policies will be utilized. Although based on Army and Air Force RPMA data, the procedures should be generally applicable to the Navy as well. Suggestions for the final presentation of analysis results are also provided. The recommended format should provide all the information required to decide whether the RPMA consolidation is feasible.

*A*

# FOREWORD

This research was conducted for the Directorate of Facilities Engineering, Office of the Chief of Engineers (OCE), under U.S. Army Project Order ENG-CERL-75-5, dated 25 June 1975. The work was performed by the Facility Systems Branch (FOS), Facility Operations Division (FO), U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL.

The OCE Technical Monitor was Mr. T. Kumagai, DAEN-FEP. The study was conducted under the general supervision of Mr. D. W. Brown, Principal Investigator, FOS, Mr. Richard J. Colver, Chief, FOS, and Mr. R. B. Blackmon, Chief, FO.

The contributions of the following persons are acknowledged: Mr. R. A. Adelt, CERL-FOS, for his overall effort in preparing the consolidation reports; and Mr. K. R. Parker, DAEN-FES, for his guidance in using the Automated Staffing Guide Program.

COL J. E. Hays is Commander and Director of CERL and Dr. L. R. Shaffer is Technical Director.

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CONSOLIDATION OF RPMA AT FAYETTEVILLE, NC  
VOLUME IV: GENERAL PROCEDURES FOR  
CONDUCTING RPMA CONSOLIDATION STUDIES

## 1 INTRODUCTION

### Background

The Office of Plans and Policy, Directorate of Facilities Engineering, Office of the Chief of Engineers (DAEN-FEP) tasked the U.S. Army Construction Engineering Research Laboratory (CERL) with performing a cost analysis of consolidating real property maintenance activities (RPMA) in the Fayetteville, NC area. As part of this consolidation study, CERL was tasked with documenting the procedures used for the cost analysis and preparing a general guide for conducting future consolidation studies.

The CERL RPMA consolidation study for the Fayetteville area (Fort Bragg/Pope AFB) has been documented in the following reports:

1. Volume I - *Executive Summary for the Study of Consolidation of RPMA in the Fayetteville, NC Area*<sup>1</sup>
2. Volume II - *Summary Cost Analysis for Consolidation of RPMA in the Fayetteville, NC Area*<sup>2</sup>
3. Volume III - *Cost Analysis Support and Backup Data for the Consolidation of RPMA in the Fayetteville, NC Area*<sup>3</sup>
4. Volume IV - *General Procedures for Conducting RPMA Consolidation Studies*
5. Volume V - *Structural Fire Protection/Prevention Consolidation Study for Fayetteville, NC Area*.<sup>4</sup>

<sup>1</sup>David W. Brown, Jeffrey G. Kirby, and Joyce L. Nay, *Executive Summary for the Study of Consolidation of RPMA in the Fayetteville, NC Area*, Technical Report C-73, Vol I/ADA033754 (U.S. Army Construction Engineering Research Laboratory [CERL], December 1976).

<sup>2</sup>D. W. Brown, J. G. Kirby, and J. L. Nay, *Summary Cost Analysis for Consolidation of RPMA in the Fayetteville, NC Area*, Technical Report C-73, Vol II/ADA030518 (CERL, September 1976).

<sup>3</sup>D. W. Brown, J. G. Kirby, and J. L. Nay, *Cost Analysis Support and Backup Data for Consolidation of RPMA in the Fayetteville, NC Area*, Technical Report C-73, Vol III/ADA030519 (CERL, September 1976).

<sup>4</sup>David W. Brown, *Structural Fire Protection/Prevention Consolidation Study for Fayetteville, NC Area*, Technical Report P-54/ADA018217 (CERL, November 1975).



## 2 INITIATION OF A COST ANALYSIS RPMA CONSOLIDATION STUDY

### Consolidation Committee

Successful completion of a consolidation study requires a dedicated evaluation team. DOD guidelines established the Department of Defense Real Property Maintenance Consolidation Committee (DODRPMCC) and the Local Department of Defense Real Property Maintenance Consolidation Committees (LDODRPMCC) to perform RPMA consolidation surveys.<sup>6</sup>

### Study Plan

The DODRPMCC objective is to improve efficiency and reduce cost to the government through RPMA consolidation without impairment of mission responsiveness. The benefits attributed to consolidation are:

1. Decrease in the number of administrative, technical, and supervisory overhead costs
2. Reduction of government investments and maintenance cost in special-purpose vehicles and equipment
3. Reduction in inventory of spare parts and critical materials for maintenance work
4. Expansion of the work force base to improve engineering and managerial capabilities.

The DOD guidelines specify the following tasks to be performed by the LDODRPMCC, but do not limit the study to these tasks:

1. Determine if any RPMA organizations/functions can be combined
2. Review existing Interservice Support Agreements (ISSA)
3. Determine if overhead costs can be reduced
4. Review funding requirements.

Guidelines in performing consolidation studies can be obtained from the consolidation surveys performed at Fayetteville, NC and Scofield Barracks, HI<sup>7</sup> by the Army and at San Antonio, TX<sup>8</sup> by the Air Force.

<sup>6</sup>Memorandum, Deputy Assistant Secretary of Defense (I&H), Subject: Consolidation of Real Property Maintenance Activities at Military Installations (8 June 1972).

<sup>7</sup>*Consolidated Engineer Real Property Maintenance Activity, Hawaii* (U.S. Army Support Command, Hawaii, December 1975).

<sup>8</sup>*San Antonio Real Property Maintenance Agency (SARPMA) Cost Analysis Report, Vol I and II* (1975).

### Purpose

The purpose of this report is to present general procedures for performing a cost analysis\* of RPMA consolidation. The general procedures are in support of the Department of Defense (DOD) guidelines for RPMA consolidation surveys at military installations.<sup>5</sup> The report is structured to answer the entire spectrum of general procedural questions related to the performance of the cost analysis portion of RPMA consolidation studies.

### Scope

The procedures in this guide are based on the assumptions that the Army will be the lead service, and Army policies will be used. Although this report is designed to answer questions related to Army/Air Force facilities engineering consolidations, the general concepts should be generally applicable to Army/Navy consolidations as well.

The unique requirements of individual locations will necessitate variations from the recommended procedures. Thus, the procedures should be used as a guide and modified as required.

### Organization of Report

This report is organized into five major sections. Information related to the initiation and review of a consolidation study is given in Chapter 2. Chapter 3 presents the significant factors to be considered in a consolidation study. Chapter 4 details the required data collection procedures for the preconsolidation operations. The method for constructing the resources required for a consolidated facilities engineering organization is described in Chapter 5. Chapter 6 gives the comparative analysis and presentation of study results.

---

\*Factors considered in a cost analysis are tangible and involve resources (labor, materials, equipment, and/or facilities). A quantitative approach is utilized; subjective evaluations are utilized on a last-report basis.

<sup>5</sup>Memorandum, Deputy Assistant Secretary of Defense (I&H), Subject: Consolidation of Real Property Maintenance Activities at Military Installations (8 June 1972).

The consolidated RPMA workload and manpower requirements established by the LDODRPMCC must be compared with the current method of operation (CMO) to identify any resulting cost savings attributable to consolidation. The consolidated real property (workload) requirements are treated as additive using CMO data, i.e., square footage of floor space maintained, number of family housing units, etc. CMO/consolidated real property requirements will establish the basis for manpower determination. Several methods have been used to staff RPMA consolidated organizations. One method is to follow and apply prescribed Army, Air Force, or Navy staffing guide procedures and determine established manpower requirement for each function within the consolidated organization. Another method is to treat CMO direct nonsupervisory requirements as additive and establish the consolidated manpower requirements for the direct supervisory and administrative staff.

The procedures presented in this guide are based on the Army staffing guide but are applicable, in general, to any method. The LDODRPMCC should obtain DA guidance on whether this approach is to be pursued.

The DOD guidelines<sup>9</sup> and Department of the Army (DA) guidelines furnished to the LDODRPMACC should be followed by utilizing the study plan presented below.

Clearly defining the boundaries of the cost analysis at its initiation is important. It is recommended that a study plan similar to the one in Appendix A be followed. This format provides a well-structured definition of the background of the study, the study's objectives and limits, the assumptions utilized, the essential features of the study, the external constraints placed on the study, and the methodology utilized in performing the analysis. The development and review of this study plan by all parties involved with the consolidation study should reduce any disagreement in scope, goals, or procedures during the performance and final review of the study. The study plan should also include the proposed milestones and their corresponding completion dates. All involved parties would thus have a clear idea of the time frame of their involvement and the proposed delivery dates of draft and final reports.

The study team should identify and include the essential cost elements from AR 235-5<sup>10</sup> and the guidelines in the Department of Army Letter on installation consolidations.<sup>11</sup>

<sup>9</sup>Memorandum, Deputy Assistant Secretary of Defense (I&H), Subject: Consolidation of Real Property Maintenance Activities at Military Installations (8 June 1972).

<sup>10</sup>*Industrial Activities and Labor Relations, Management of Resources, Commercial and Industrial-Type Functions*, AR 235-5, C3 (Department of the Army, 6 November 1974).

<sup>11</sup>Letter, DA, DAAG-PAP-A(M) (31 July 1974) DACS-DMA, Subject: Installation and Activity Consolidation, Realignments, Reductions and Closures (8 August 1974).



### Organizational Concept

After completion of the study plan, the next step is to develop an organizational concept for the consolidation organization based on the structure of the Directorate of Facilities Engineering given in AR 420-10.<sup>12</sup> Member installations, specific duties required, reporting requirements, availability of installation support, and many other specific considerations must be considered before the organizational concept is finalized. The specific requirements for the particular consolidated organization should be considered as additions to or deletions from the general facilities engineering (FE)\* organization. The important features of the organizational concept are an organizational chart and a definition of the functional elements.

The general consolidated RPMA organization detailed in Chapter 6 of Volume III should serve as an example for designing an organization to meet the specific study need. It is a general FE organization modified to accommodate Army industrial funding (AIF) activities.

Modifications to the structure given in AF 420-10 must be evaluated individually at each consolidation site before they are incorporated into the new organization.

### Method of Funding

An important operational concept that must be resolved at the initiation of the study is how the consolidated organization will be funded. The guidance presented is applicable to an appropriation-funded operation or Army industrially funded operation. Appropriation funding is used to fund installation services; no distinction between cost to various users is made. In contrast, industrial funding requires the benefiting activity to reimburse the fund for the full cost of goods and services received. Industrial funding does offer some distinct advantages over appropriation funding. These advantages are identified in Volume III, page 23.

### Legal Analysis of Consolidation

The CERL study team performed a legal analysis of consolidations and industrial funded organizations (see Volume III, Chapter 5). There is legal precedent for the authority to consolidate. The necessary funds and civilian employees to perform RPMA may be transferred from one

<sup>12</sup>*Facilities Engineering: General Provisions, Organization, Functions, and Personnel*, AR 420-10 (Department of the Army, 30 May 1975).

\*In this report, FE is used to represent facilities engineering in general and to identify the Army Directorate of Facilities Engineering.

department or agency to another. The "turnover" of real property and equipment to the new agency created by the consolidation is merely an administrative matter and presents no legal complications. The legal analysis has been documented in the CERL study and will not need to be performed again in future consolidation studies. The CERL study also documents the legal precedent for the authority for an AIF organization (AIFO).

#### Review of Study

It is important that the commands of the affected installations and their higher headquarters be kept informed of the progress of the consolidation study.

One effective way of keeping all concerned parties informed is via intermediate draft reports which will allow official comment to be incorporated prior to the issuing of a final report. A minimum of two reports is necessary. One report should present the workload and resource requirements of the current method of operation (CMO). This report should detail the current workload by FE activity cost center and should also present the currently required labor force, equipment inventory, and facilities. A summary cost analysis report should also be staffed for review. This report should present the economic consequences of consolidation and compare the consolidated resource requirements with those of the CMO. Substantial resource differences between the CMO and the consolidated organization should be explained.

Review of the cost evaluation methodology is necessary as early in the study as possible. The Army Audit Agency (AAA) can provide such a review. The suggested time for this AAA review is at the completion of the draft summary cost analysis report, if the procedure and cost are completely documented. It is important that good audit trails be established to support data used in the study.

Review comments on draft reports should be carefully analyzed. Whenever possible, the comments should be incorporated into the final report. A position statement on those that are not incorporated should be forwarded to the project sponsor.

Providing the interested parties with progress reports and utilizing their review comments can smooth the process of performing the study and expedite approval of the final results. It is important to allow adequate review time within the study plan for the staffing of draft reports. An absolute minimum of 1 month per report should be scheduled.

### 3 SIGNIFICANT FACTORS

The significant factors that must be considered in an RPMA consolidation analysis include the principal cost elements as well as non-cost requirements. The significant factors discussed in this chapter are real property, manpower, installation support, equipment, consolidated space requirements, charge-out rates, activity civil engineer, fire protection and prevention, residual engineering organization, implementation costs, and environmental impact assessment. These factors should not be construed as the only factors to be considered in a particular study; rather, they should be used as a guide for identifying the principal elements to be evaluated.

#### Real Property

Real property data should be collected with a twofold intent: to define the area of RPMA responsibility and to determine RPMA funding requirements. Data pertaining to the above will be useful in determining related FE staffing requirements as well as in providing a basis for developing an operating budget. Real property data may also prove valuable when amortizing certain FE expenditures.

#### Manpower

Facilities engineering is a labor-intensive activity. A significant portion of the costs and savings to be realized by RPMA consolidation will be identified as labor. Labor resources can be categorized as in-house manpower and out-of-house support. In-house manpower includes dedicated labor on the payroll of the FE organization, plus military labor assigned to the FE. Out-of-house support can be provided (without direct charge) from military labor, Interservice Support Agreements (ISSA), installation support agencies, or commercial contracts (direct cost). The out-of-house support provided by the installation is itself considered a significant factor and is discussed separately.

#### *Staffing Allocations*

Several terms are used to refer to the staffing allocations or manpower levels of government agencies. These terms are defined in the following subsections.

"Recognized ." The recognized manpower requirements are determined by a manpower survey team application of established yardsticks within a standardized staffing guide. Local appraisals may be requested if the staffing guide does not adequately cover special requirements or circumstances. The recognized manpower requirements provide the maximum staffing levels allowed.

"Authorized." The authorized manpower requirement is the manpower allotment assigned by the installation's command. The authorized level may be less than but not greater than the recognized level.

"FE Recommended." The FE commander prepares recommendations of the staffing requirement necessary to perform all FE functions. The manpower survey team considers the FE evaluation in determining the recognized manpower requirement. When the FE receives the authorized manpower level from the installation commander, he/she can move manpower from division to division or shop to shop, etc., but the total staffing level cannot exceed the authorized level. This internal redistribution of manpower can only be observed by comparing the on-board staffing levels and those developed in the manpower survey.

"On-Board." The on-board manpower level refers to the actual number of personnel employed at a specific time.

#### *In-House Manpower*

In-house manpower can be categorized in three ways: nonsupervisory or supervisory; direct labor or administrative support; military or civilian.

Nonsupervisory. Nonsupervisory personnel perform the labor required to complete a job under the direction of the supervisor. Included in this category are nonsupervisory FE administrative and clerical staff.

Supervisory. A supervisor performs all or some of the following: planning, programming, directing, coordinating, and management tasks that are required for accomplishment of a specific job. Planning and programming involve all decision making preceding actual accomplishment of a job, such as determining the nature and scope of the work to be performed and the materials, equipment, and manpower required. Directing involves the overseeing and managing of the labor. Coordinating involves relating the tasks used to accomplish the job.

Direct Labor. Direct labor includes all RPMA operations and maintenance (O&M) shop staff within the FE organization up to and including shop foremen.

Administrative Support. All staff representatives from the FE commander down to the shop foreman level of the FE organization are categorized as administrative support. This includes both nonsupervisory and supervisory staff. Fire prevention/protection personnel must be analyzed separately from the rest of the FE organization for both the administrative support and direct labor classifications because their functions differ significantly from RPMA functions.

Military Manpower In-House. Military manpower assigned for continuous service to the FE organization is considered in-house manpower.



Military manpower may, of course, fall into nonsupervisory or supervisory and direct or administrative categories.

1. Officers. Most FE organizations are assigned a military officer as the commander (Director of Facilities Engineering [FE], Base Civil Engineer [BCE], or Public Works Officer) and other officers, typically for operations and environment and energy control.

2. Troop Support. Military labor may be assigned to FE organizations as part of the authorized staffing allocations and funding authorizations. The Air Force has military labor assigned throughout the FE organizations. The Army usually has military support attached to the Buildings and Grounds Division on a permanent basis.

3. QMAD. The Army has a special critical augmentation program for military troops called Quarterly Manpower Authorization Document (QMAD). These troops are assigned full-time to the FE organization, but a quarterly review of the position requirements is required. QMAD personnel are not part of the FE staffing allocation, but are obtained through an agreement with the installation. The QMAD personnel fill the lower skill level positions; the vacated positions are utilized in critically needed areas.

4. Prime BEEF Team. The Air Force has a special RPMA training requirement for military troops at designated bases called the Base Engineering Emergency Force (Prime BEEF) Program. The Prime BEEF program is designed to provide a mobile, rapid response capability for tactical air, special air warfare, contingency, and disaster requirements. The team consists of a skilled labor force trained to maintain essential base facility operations before, during, and immediately after any emergency. One or more of the six types of standing teams in the Prime BEEF program will be assigned to the selected Air Force base:

- a. Base Recovery Team (BEEF-R)
- b. Contingency Team (BEEF-C)
- c. Flyaway Team (BEEF-F)
- d. Missile Team (BEEF-M)
- e. Logistic and Support Team (BEEF-LS)
- f. Engineering Assistance Team (BEEF-E).

The BCE is authorized positions for the Prime BEEF Team through staffing allocations and funding authorizations. The total of Prime BEEF positions, other military, and civilian positions should not exceed manpower requirements.

### *Out-of-House Support*

Out-of-house support refers to labor which, although not assigned or part of the authorized staffing allocations of the FE organization, performs a portion of RPMA on the installation. The out-of-house support can be provided by troop labor from Engineer Troop Project Support, Self-Help Support, or contract labor. QMAD personnel, as explained earlier, are considered in-house labor. The engineering troop labor is not charged to the FE organization for any of the work accomplished. The FE organization does not staff for the workload expected to be performed by this external troop support or by contract.

Engineer Troop Project Support. The Army Engineer Troop units perform some RPMA projects throughout the year for training purposes. The project may be developed and designed by the FE organization; however, the projects are completed independently of the FE.

Self-Help Support. Self-Help Support performs small projects involving grounds maintenance, carpentry, painting, plumbing, and electrical repairs. Each battalion has a self-help work force comprised of one man donated from each company and a self-help coordinator to review work requirements and issue materials. Occupants of family housing also perform self-help.

Contracted Labor. FE work which cannot be performed in-house or by troop labor can be contracted. The workload to be accomplished by contract is normally established in terms of priorities when the annual work plan is developed.

### Installation Support

Both the Army and Air Force operate under the same basic installation support concept; performance of services which are common to most activities are consolidated at the installation level. These services are provided to all customers on an as-required basis. Support agencies are staffed and funded separately for the total amount of installation support to be accomplished, and no charges are incurred by customers except for supplies and materials. Because support agencies are separately funded for total workload, they are not required to identify or record the amount of effort expended in providing support to a customer (some exceptions, such as the Management Information Systems Office [MISO], do exist).

The amount of labor in man-years and the cost of providing this support to an FE organization must be identified. The consolidated support requirements can be developed from the current resource requirements.

The following areas of support have been identified as significant efforts typically provided to the FE organization by the installation.

### *Comptroller*

The comptroller provides service in financial matters. Payments made by the FE organization for goods and services must be verified and paid by the comptroller. Also included in these services are payment of compensation and travel pay to military and civilian personnel and administration and management of financial records. The comptroller also performs budget and audit actions.

### *Communications-Electronics*

The Communications-Electronics Section on an Army installation and Communications Squadron on an Air Force base perform similar functions. If the telephone system is government owned, they are responsible for its operation and maintenance, including installation and maintenance of telephone lines, instruments, and special communications equipment. Operators are also provided for the Automatic Voice Network (AUTOVON) and Wide Area Telephone Service (WATS). If the telephone system is commercially owned and operated, communications personnel are responsible for monitoring costs incurred by customers and insuring proper usage of the system.

### *Civilian Personnel Office*

Army and Air Force Civilian Personnel Offices (CPO) provide normal CPO support to the civilian employees of the FE organization. This support includes recruitment and placement, employee relations, union relations, training, processing of personnel actions, and maintenance of personnel records.

### *Automated Data Processing Support*

MISO on an Army installation and Data Automation on an Air Force base provide similar services to their respective FE organizations. The services include the operation of computer hardware necessary to support FE automated systems and technical assistance on the proper use of automated products. In addition, Data Automation provides the BCE with a remote unit for direct access to the computer.

### *Adjutant General*

The Adjutant General on an Army installation provides several administrative services to the FE organization: management and supply of required forms and publications and operation of a printing plant and a distribution center for official correspondence. Air Force Base Administration provides similar services plus equipment, such as a copy machine, for BCE use.

### *Supply Support*

The Installation Supply Office at the DIO provides support to the FE in issuing supplies such as safety clothing and equipment, batteries,

and battery acid; operating the Self-Service Supply Center for office supplies, cleaning supplies, hand tools, etc.; and processing documents for distribution of heating oil. RPMA material supply is accomplished by the FE. Air Force Base Supply provides these services plus many more to the BCE. All requirements for RPMA materials, equipment, or other supplies are processed by Base Supply, which also provides receipt and warehousing of construction materials stockage items.

#### *Procurement Support*

Procurement Division, DIO (Army) and Base Procurement (Air Force) provide issuance, administration, and management of service and construction contracts for the FE organizations. They also accomplish local purchase actions for required construction materials. The basic difference in operation is that the FE is a direct customer of the Procurement Division for local purchases, while the BCE is not a direct customer of Base Procurement even though materials are being procured for it. Base Supply is the direct customer, since it processes all supply actions for the BCE and other base agencies.

#### *Equipment Support*

The Transportation and Movements Branches of the Transportation Division (DIO) provide service to the FE. The Transportation Motor Pool (TMP) dispatches general-purpose vehicles for FE use and performs the maintenance on those vehicles. Special-purpose equipment is owned and maintained by the FE. The Movements Branch performs document control and material-handling actions for all incoming rail and motor transport shipments of construction and other supplies destined for the FE.

Air Force Base Transportation provides and maintains all special- and general-purpose vehicles for the BCE. Unlike the FE organization, no organic maintenance capability exists within the BCE.

The Material Maintenance Division (DIO) provides direct support and general support maintenance to FE engineer equipment and limited maintenance on ordnance equipment. It repairs canvas, power tools, and furniture, and performs hydrostatic testing of fire extinguishers and breathing apparatus. Limited machine shop service is provided for fabrication of nonstandard or unavailable parts for FE fixed property.

#### *Summary*

The above discussion indicates that although the Army's and Air Force's basic concepts of installation support are similar, there are differences in the way business is conducted and the level of support provided. Because of these differences, direct comparison of Army and Air Force support agencies is not always feasible; instead, the entire support package must be reviewed along with the analysis of the CMO of the FE organizations.



## Equipment

Consolidation of RPMA organizations provides the opportunity to eliminate duplicate and/or excess equipment. The combined equipment requirements should be developed by analyzing the individual utilization requirements. The equipment which is determined to be surplus can be transferred to other organizations (a cost avoidance) or sold (a one-time savings). The FE equipment is categorized as vehicles, shop equipment, and office equipment.

### *Vehicles*

Vehicles consist of sedans, pickup trucks, graders, cranes, tractors, etc. The FE vehicles can be divided into two subclasses: general-purpose vehicles and special-purpose vehicles.

General-Purpose (GP) Vehicles. The GP vehicles are usually sedans, station wagons, vans, etc., which are used to transport personnel, small equipment, tools, and materials. These vehicles are not owned by the FE organization but are supplied by the installation. The Army vehicles are supplied by the TMP, and the Air Force vehicles are supplied by Base Transportation.

Special-Purpose (SP) Vehicles. The SP vehicles are usually specially configured to accomplish a particular FE mission. They include construction-type equipment and specialized maintenance vehicles such as cranes, bulldozers, etc. The SP vehicles are the property of the FE organization or are dedicated exclusively to the BCE.

### *Shop Equipment*

Shop equipment should be analyzed in two classifications: equipment with an initial value greater than or equal to \$1,000 (with accessories) and equipment with an initial value less than \$1,000. Shop equipment with initial value greater than \$1,000 includes large shop equipment such as lathes, saws, generators, welders, etc. This equipment is usually installed in the shops or mounted on trailers for transporting to job sites. Shop equipment costing less than \$1,000 includes small tools, sprayers, battery chargers, etc.

### *Office Equipment*

Office equipment is classified as office furniture or office machines. Office furniture includes nonexpendable items which have a life expectancy in excess of 1 year, such as desks, file cabinets, chairs, drafting tables, etc. Office machines include typewriters, adding machines, calculators, and the like.

### Space Requirements

One factor which will affect consolidation plans is the physical plant required to support the consolidated organization. In order to plan for this, the existing facilities of the FE/BCE must be surveyed to identify required facilities for the consolidated organization. When considering facilities required for a consolidated organization, two alternatives with various suboptions are available: constructing new facilities or using existing ones. The suboptions include variations or combinations of these alternatives.

### Charge-Out Rates

Estimates of base-year labor and utility rates must be developed to construct the charge-out rates. The cost elements must be established for the charge-out rates. An appropriation fund operation cannot recover all expenses for work performed, while an industrial fund operation can recover all expenses. An example of the appropriate cost-related elements for an AIFO is presented below.

#### *Overhead Rates*

The AIFO must be fully reimbursed for the work performed in order to maintain a zero profit and loss position. Thus, it must charge its customers a fair share of its overhead expenses. Overhead rates can be developed for administrative and direct overhead expenses; these rates are added to the direct labor and utility rates. The FE overhead expenses include FE administrative labor costs, fringe benefits (wage grade and general schedule), leave (annual, compensatory, and sick), and other (travel, training, and other administrative expenses).

#### *Direct Labor Rates*

The estimated charge-out rates for direct labor include the FE overhead expense. The hourly rates for direct labor can be developed using the basic pay plus fringe and leave cost benefits for each FE direct labor function. Direct labor rates should be presented with and without the overhead rate.

#### *Utility Service Rates*

The existing base-year utility rate determinations are used to estimate the new utility rates. This cost estimate must also include the FE administrative overhead rate applicable to utility operation and maintenance costs.

The utility resources include electricity, fuels, sewage, and water; data on the CMO consumptions of these resources and their respective cost requirements will allow determination of the consolidated RPMA utility requirements.

### Activity Civil Engineer

If an AIFO is being considered, an activity civil engineer (ACE) or other in-house customer representative will be required. The ACE will respond to customer's questions on programming and project status and provide technical advice. The number of ACEs required will depend on the number of customers (installations, tenants, nonappropriated funded organizations, etc).

### Fire Protection and Prevention

Fire protection and prevention for the installation is usually a responsibility of the FE organization. It should be evaluated separately from the rest of the consolidation study because of its size and activities unrelated to the other FE functions. The fire department requires minimal support from the rest of the FE organization and requires separate staffing procedures. The effectiveness of the services provided should be examined, and duplication of resources and requirements should be identified. The consolidation fire study should be accomplished in accordance with the Deputy Assistant Secretary of Defense Memorandum of 13 May 1975.<sup>13</sup>

### Residual Engineering Organization

A residual engineering organization (REO) must be established at the installations giving up the FE operation to provide the installation commander with an engineering staff for planning and coordinating RPMA. The REO may obtain technical services from the consolidated organization. The size and types of staffing for the REO must be carefully determined and weighted to ensure maximum effectiveness. The staffing should consider a liaison officer, budget, master planning, real property, and family housing requirements.

### Implementation Costs

The implementation cost is the investment required to consolidate RPMA at the selected military installations into a single FE organization. The payoff period, or time to recover the conversion costs, should be identified. Conversion costs should be determined in a two-phase approach. The goal of the first phase is to provide a rough

<sup>13</sup>Memorandum, Deputy Assistant Secretary of Defense (I&H), Subject: Consolidation of Real Property Maintenance Activities (RPMA) at Military Installations (13 May 1975).

estimate of the implementation costs to be included in the RPMA cost analysis. Identification of the cost parameters of consolidated organization implementation may vary significantly depending on local influences; however, certain major cost elements are identifiable. Some of the areas to be considered in developing the phase-one cost estimate are provided below. The second phase is an implementation evaluation to develop a more detailed and accurate estimate of the implementation costs and procedures. It should be performed by an implementation team after the feasibility study has been completed.

#### *Implementation Team Costs*

A preconsolidation team must be formed to establish and organize the consolidated organization so that an orderly transfer of RPMA and facilities can be accomplished. It is essential that all costs, including Military Construction Army (MCA) costs, be identified for budget submission if a consolidation decision is made.

#### *Equipment Costs*

Equipment cost could be incurred by new purchases, modifications for system compatibility, and manhours expended in a physical inventory of reassigned equipment. These cost elements constitute a minimum to be considered when evaluating the implementation costs attributable to equipment. It is assumed that the CMO equipment inventory will be transferred to the consolidated organization; however, new purchase costs for required equipment which is not reassigned would be included in this category.

#### *Space Requirement Costs*

The building and alteration costs identified from the consolidation space requirements analysis must be included in the implementation costs.

#### *Personnel Relocation Costs*

The cost of personnel relocation includes moving related equipment. Administrative personnel moving costs include office furniture and machines, while direct labor moving costs may include shop equipment, etc.

#### *Severance Pay Cost*

If a reduction-in-force results from the consolidation action, severance pay may be claimed.

#### *Automated Reporting Systems Costs*

Since the Army, Air Force, and Navy have separate automated reporting systems for RPMA, the costs of supplying the Air Force and/or



Navy with required reports which do not exist in the Army system may be an additional consolidation cost. This cost may involve reprogramming or adding new computer programs to the Army's Integrated Facilities System (IFS).

#### *AIF Corpus*

If an (AIFO) is to be established, a corpus must be established. The corpus is the permanent revolving fund with which the AIFO sustains its operations. Since the work performed by the AIFO is reimbursable, the fund is not depleted and is therefore not truly an implementation cost. However, it is needed prior to initial AIFO operations to pay for salaries and materials before accruals.

#### Environmental Impact Assessment

The consolidation of RPMA at military installations is justified if it reduces total direct and indirect governmental expenditures for FE activities. Obtaining this goal requires reduction of some FE personnel positions, equipment requirements, and services related to providing support to these functions. The decision to consolidate the FE organizations cannot be based solely on the immediate savings. The impact of the proposed changes on the level of activity at the installations will affect the economy of local communities and the region. If the impact of the consolidation action is determined to be significant, an environmental impact statement must be prepared.

#### 4 SURVEY OF CURRENT METHOD OF OPERATION (CMO)

Examination of the feasibility of RPMA consolidation requires quantitative definition of the existing FE organizations' RPMA workload. A survey of RPMA workload should be conducted for a 12-month base period with complete documentation exemplifying the typical RPMA workload. A survey conducted when abnormal influences have altered the workload would not provide an objective basis from which to evaluate the consolidated organization. An abnormal RPMA workload base year would be one in which a natural disaster or mass reorganization occurred, or new programs of considerable magnitude were introduced. The greater the number of FE organizations to be evaluated for possible consolidation, the greater the likelihood that a base year cannot be selected without some complications. Some records are retained for less than a year before being destroyed; this makes collecting data for the entire base year impossible. Such data must be projected from the available base year data or current data, or the current data must be used. The survey procedures identified in this chapter assume that the BCE has an automated reporting/management system and the FE does not.

The survey will require collection of the following data:

1. Real property summaries by facility classes and construction categories
2. Workload by type and quantity of work order for each FE function (manhours and labor rate costs should be included)
3. FE manpower requirements by recognized/recommended, authorized, and on-board staffing levels, and labor costs by function
4. Installation support by man-years of effort, costs of manpower
5. Equipment
6. FE existing space requirements
7. Utility summaries which reflect consumption rates and costs.

Information sources for the required information and suggested data collection formats are identified in the following sections.

##### Real Property Measurement

The real property measurements are used to determine the scope of the RPMA workload and establish manpower requirements for a portion of the functional levels within the FE organization.

The Department of the Army (DA) identifies and classifies real property by facility classes and construction categories.<sup>14</sup> The categories are designated by five-digit codes which are used to classify all items of real property. The first digit of the code, which is any number 1 through 9, indicates the facility code. A 1 indicates operational and training facilities; 2, maintenance and production facilities; 3, research, development, and test facilities; 4, supply facilities; 5, hospital and medical facilities; 6, administrative facilities; 7, housing and community facilities; 8, utilities and ground facilities; and 9, real estate. The second digit of the code indicates the category group; the third, the basic category; and the last two, the specific item. For example, the real property code for a motor repair shop is 21410. The 2 represents the facility class--maintenance and production facilities; the 1 represents the category group--maintenance; the 4 indicates the basic category--tank, automotive; and the 10 denotes the specific item--motor repair shops.

The Air Force also uses real property codes to describe and identify their real property; therefore, the data collection format can be the same for both the Army and Air Force. Data reference sources, data collection processes, and the data collection format are identified in the following sections.

#### *Army*

Data Reference Source. The Real Property Branch of the FE organization prepares a monthly memorandum which provides the current status of all FE real property (Tech Data Report). Real property data are identified in the "Building Information Schedule/Master Plan" available in the Master Planning Branch of the FE, should the above report not be available.

Data Collection Process. Real property codes should be grouped to obtain similar units of measure, e.g., square miles, etc. Units of measure for each facility class can be summed to determine the scope of the RPMA workload. It is important to note that the first three digits of the numeric code will provide sufficient real property identification for the required items. If the Real Property Branch prepares a real property summary (informal memorandum) by facility class, the laborious collection process identified above will not be necessary.

Data Collection Format. The format to be used in the data collection process should include the following real property descriptions:

Grounds . . . . .	Total Acreage
Buildings . . . . .	Number of Facilities
Family Housing Units . . . . .	Number of Units
Total Floor Space . . . . .	Square Footage

<sup>14</sup>*Construction: Department of the Army Facility Classes and Construction Categories*, AR 415-28 (Department of the Army, 15 October 1973).

U.S. Army Reserve Centers . . . . .	Number of Centers
Roads . . . . .	Square Yardage
Railroads . . . . .	Linear Footage
Parking/Open Storage . . . . .	Square Yardage
Walks and Other . . . . .	Square Yardage
Airfield Pavements . . . . .	Square Yardage
Utility Distribution . . . . .	Linear Footage

The units of measure identified above will be available from the summations of real property by facility class.

#### *Air Force*

Data Reference Source. Real property data are available from the Real Estate Management Office within the BCE organization. Two Base Engineering Automated Management System (BEAMS) products are available-- PCN-N200152 Real Property Control Ledger and RCS: HAF-PRE(SA17115) USAF Real Property Inventory Detail List. The Real Property Inventory Detail List provides real property by facility classes and/or real property codes.

Data Collection Process. The data collection process identified for the Army should also be used for the Air Force. Although the facility classes are similar, the Air Force six-digit numeric codes tend to have a more finite categorization. The first three digits of the code will normally be sufficient to categorize real property.

Data Collection Format. The format to be used in data collection of real property variables will be the same as that used for the Army.

#### Integration of FE Functions

The RPMA consolidation study plan containing the organizational concept for the consolidated organization should be completed prior to initiating the CMO survey. It is essential to identify the work requirements existing at each functional level within the FE organization.<sup>15</sup> This knowledge is required to appropriately integrate each FE organization's functions and related workload data into the consolidated FE organizational structure.

The consolidated organizational structure is modeled after the Directorate of Facilities Engineering organization presented in the *Staffing Guide for U.S. Army Garrisons*.<sup>16</sup> Functional work descriptions identified in the Staffing Guide must be compared with those of each FE

<sup>15</sup>*Unconstrained Requirements Report*, AR 420-8 (Department of the Army, 4 April 1974).

<sup>16</sup>*Staffing Guide for U.S. Army Garrisons*, DA Pam 570-551, Change 4 (Department of the Army, 24 August 1976).



organization being evaluated, and shops within each organization must be standardized to fit these descriptions.

Integration of FE organizations should be relatively easy, since organizational differences should be minimal. However, integration of Air Force or Navy FE organizations will be more complex due to differences in organizational classifications. For example, the Army carpentry and masonry work is performed by the Carpentry Shop, while the Air Force divides these functions between the Structural Maintenance and Masonry Shops. Thus, the Carpentry Shop in the consolidated FE organization would include the combined workload data of these three existing FE shops from the preconsolidation Army and Air Force FE organizations.

The Army and Air Force FE organizational charts will be useful guides in identifying the existing FE functional levels. Figure 1 shows the format for the integration of existing FE functions into the Staffing Guide organizational descriptions.

#### CMO Workload

Workload data for the base year are to be collected for each function within the FE organization. The workload analysis guidance presented in this section is designed for the Army work management system. Data obtained from the BCE organization must be organized and categorized according to Army terminology.

#### *Organization of Work Order Activity According to Army Terminology*

The following definitions, examples of RPMA work, and descriptions of types of work orders used in accomplishing recurring and nonrecurring work will help in collecting and analyzing the Army and Air Force RPMA workload data using the same criteria.

Recurring Work. Recurring work is defined as work on facilities, systems, or equipment that is repetitive in nature and can be scheduled at specified intervals of at least once a year. It includes work required to support routine recurring and emergency maintenance and repair activities which minimize facility deterioration.<sup>17</sup> Examples of recurring work include:

1. Seasonal inspections of drainage ditches (the inspection for work requirements only, not the work itself)
2. Inspections of runways, taxiways, air conditioners, and swimming pools before repair and/or overhaul

<sup>17</sup>Unconstrained Requirements Report, AR 420-8 (Department of the Army, April 1974).

<u>Consolidated Organization</u>		<u>FE Organization (CMO)</u>	
<u>Yardstick Code</u>	<u>Functional Title</u>	<u>Shop No.</u>	<u>Functional Title</u>

Figure 1. Format for integration of CMO and consolidated organizational functions.

3. Performance of periodic maintenance--weekly, monthly, and so forth

4. Grass cutting

5. Snow removal

6. Herbicide application

7. Pruning

8. Changing filters

9. Scheduled motor lubrication.

Nonrecurring Work. Nonrecurring work is defined as work which cannot be pre-identified in scope and/or frequency. Nonrecurring work includes work required to restore a deteriorated facility to its original or DA standards; i.e., a deficiency correction or "new work" to upgrade the condition of a facility to a higher degree of mission usefulness. Examples of nonrecurring work include:

1. Replacement of roofing

2. Replacement of floor covering

3. Replacement of railroad track and ties

4. Repair of collapsed bridges

5. Repair of damage caused by boiler explosions

6. Repair of tornado, hurricane, or floor damage

7. Repair of fire damage

8. Service to domestic refrigerators and water coolers

9. Repair of dripping faucets

10. Overhaul of systems or equipment

11. Work for which material requirements are different each time the task is performed

12. Painting facilities completely, interior or exterior

13. Repairing sidewalks, roads, and other pavements

14. Alteration work

15. Minor construction.

FE Work Order Activity. Tables 1 and 2 identify the work order types typically used to initiate recurring and nonrecurring work. The work order types shown in these tables were developed to convert Air Force work orders to Army definitions. As the tables show, work order utilization is comparable for the two FE organizations.

Table 1

Work Order Utilization for Recurring Work

<u>Work Order Type</u>	<u>FE</u>	<u>BCE</u>
Service Orders	X	X
Individual Job Orders	X	
Standing Operation Orders	X	X

Table 2

Work Order Utilization for Nonrecurring Work

<u>Work Order Type</u>	<u>FE</u>	<u>BCS</u>
Service Orders		
Individual Job Orders	X	X
Standing Operation Orders		

Work order activity should be collected and analyzed for each work order type according to the following definitions:

1. Service Orders (SO)

a. Army. SOs are requests for minor jobs, including emergencies, which do not exceed 16 manhours of work or \$350. The requests are normally telephoned in to the service order specialists and then prepared for accomplishment on DA Form 2699. Estimating and scheduling of an SO is not economically justified; the requests are handled as priority to be accomplished within 1 to 5 days. The time frame may deviate from this norm, possibly extending to 30 days under certain circumstances, such as geographic pooling, awaiting material, etc.

b. Air Force. Service calls and FAST (Fast Action Service Technique) and Hopper Job Orders are used to perform work requests similar to the Army's SO. Service calls are prepared on AF Form 1879 and charged to Labor Utilization Code (LUC) 12. Their primary function is to accomplish emergency work requests received by the service call specialist.



FAST Job Orders are used when the work is classified as urgent but not an "emergency," and are scheduled to be performed within 1 to 5 days. When the job order is not of an urgent nature, it is scheduled for accomplishment by the Hopper technique (a geographic pooling), which means it will be performed within 30 days. FAST and Hopper Job Orders are identified as direct scheduled work chargeable to LUC 16. Monetary limitations are not utilized; the requests are exclusively for maintenance work to be accomplished within the time frames specified.

## 2. Individual Job Orders (IJO)

a. Army. IJOs include maintenance, repair, and minor construction requirements which exceed the scope of SO jobs (16 manhours or \$350 total cost). Detailed estimating and scheduling procedures are required for efficient utilization of resources. A Job Order Request (DA Form 2701) is used for preliminary processing, estimating, and obtaining necessary approval for an IJO. After the preliminary processing has been completed, the request is formalized into an Individual Job Order, DA Form 2700, with detailed estimates and scheduling procedures. IJOs are normally accomplished within 90 days, but certain recurring-type maintenance requests extend through the entire base year period.

b. Air Force. In-Service Work Plan (IWP) Job Orders and Work Orders are used to perform the IJO-type activities. BCE categorizes IWP Job Orders and Work Orders into: (1) minor construction, which is predominantly "new work," and (2) "other," which is maintenance and repair work. IWP Minor Construction and Other Job Orders are used when receipt of materials may prevent a job order from being accomplished within 30 days (i.e., by the Hopper technique). The job order is processed as an IWP Job Order with a monetary limitation for "new work" not to exceed \$500. IWP Job Orders are chargeable to LUCs 13 and 14. IWP Minor Construction and Other Work Orders are used when the work request exceeds the cost limitation (\$500) of an IWP Job Order, when the request involves multi-shop performance, or when the request requires facility capitalization input. IWP Work Orders are identifiable and chargeable to LUCs 15 and 18.

Detailed estimating and scheduling procedures are accomplished through the IWP, which contains approved or programmed operations, services, maintenance, repair, and minor construction work. This BCE document identifies how the RPMA in-service manpower resources are to be utilized within the forthcoming base year period in order to satisfy known and projected requirements.

The IWP job order activity can be assumed comparable to the FE IJO activity since the work accomplishment time frame is over 30 days. IWP Job and Work Orders are normally accomplished within 2 to 6 months after the order has entered the IWP program.

## 3. Standing Operation Orders (SOO)

a. Army. S00s are prepared annually on DA Form 2700 to initiate accomplishment of operations, services, and routine maintenance actions which are relatively constant and predictable. S00s are used to authorize operation of utility plants, fire protection, refuse collection, entomology services, custodial services, and preventive maintenance of buildings and equipment. In addition, S00s are planned and scheduled for definite periods of time not exceeding 1 year.

b. Air Force. The Air Force counterpart to an S00 is the Maintenance Action Sheet, AF Form 1841, which is identified and chargeable to LUCs 11 and 19. The type of work accomplished within this category involves recurring maintenance and operations/services to real property equipment and other items of equipment for which the BCE has the responsibility.

#### *RPMA Manhour Expenditures by Functions*

The FE maintains records of manhours expended on daily work order activity. The Air Force BEAMS records and totals LUC manhours per Responsibility Center/Cost Center (RC/CC) Codes, which are directly related to the FE functional levels performing shop activities. Thus, work order activity can be measured by manhours charged to S0, IJ0, and S00 work orders at the FE, and by manhours charged to LUCs at the BCE.

Monthly reports of manhour expenditures by work order activity and by shop are maintained and available through the Army Work Coordination Office and the Air Force IWP Programmer, respectively. Work order activity data collection procedures are given below.

#### Army

*Data Reference Source.* The Unit Backlog and Work Force Distribution Report is prepared monthly in compliance with DA Pam 420-6.<sup>18</sup> The information contained in this report includes total daily manhours (averaged over a 20-workday period) expended by shops for S0, IJ0, and S00 work orders and overhead (supervisory, leave, etc.).

*Data Collection Process.* The average daily manhour expenditures for a 20-workday period are reported monthly for each shop. For example, data from the Unit Backlog and Work Force Distribution Report should be recorded as shown below:

Shop:	Carpentry Section
Month:	September 1974
Workdays in September:	20
Reporting Dates:	1 through 28 September 1974
Total Daily Manhours Average:	438
September Manhours:	8,760 (20 X 438)

<sup>18</sup>The Work Management System, DA Pam 420-6 (Department of the Army, 1968).

Occasionally, the 20-day reporting dates do not correspond precisely with a 1-month period. An estimate of the labor for the unaccountable days (no labor hours reported) must then be constructed. The daily average from the preceding or succeeding month (whichever is closer to the unaccountable days) should be averaged with the survey month daily manhour average. The revised average daily manhours times the number of unaccountable workdays will provide an estimate of the monthly manhour charge for the unaccountable days.

The method of determining the total monthly manhour expenditure by shop is illustrated below using carpentry shop statistics.

Step 1. Determine the total manhours expended from the reporting document using the following steps:

- a. Select the appropriate shop: Carpentry
- b. Select the base period month to be evaluated: July 1974
- c. Record the reporting dates on the report document: June 30 through July 27, 1974
- d. Determine the number of the respective month's workdays within the reporting dates: 19 workdays
- e. Record the total daily manhour average (DMA) from the report document: 557 DMA
- f. Determine the total manhours expended within the reporting dates by multiplying the number of workdays times the total daily manhour average:  $19 \times 557 = 10,583$  monthly manhours.

Step 2. Determine the total manhours expended for any unrecorded workday using the following steps:

- a. Determine the number of possible workdays for July: 22 workdays
- b. Determine the number of workdays not accounted for by subtracting the number of workdays within the reporting dates from the possible number of workdays for July:  $22 - 19 = 3$  unrecorded days
- c. Identify the unrecorded workdays for July: 29, 30, 31 July
- d. Select the preceding or succeeding month's report document, whichever is nearest the unrecorded workdays: 4 August - 31 August 1974 (Note, 1-2 August are unrecorded workdays and must be accounted for in the August manhour determination).
- e. Record the total DMA for the second selected month from the report document: August - 454 DMA

f. Determine the manhours expended for the unrecorded workday in July by averaging the two months' daily manhour averages and multiplying this average by the number of unrecorded workdays:  $(557 \text{ DMA/July} + 454 \text{ DMA/August})/2 = 505.5 (3) = 1,516.5$ .

Step 3. Determine the total monthly manhour expenditure by adding the total monthly recorded manhours for July from Step 1 to the total unrecorded manhours from Step 2:  $10,583 + 1,516.5 = 12,099.5$  manhours for July.

*Data Collection Format.* Figure 2 shows a sample format that can be utilized to record manhour expenditures by work order activity.

#### Air Force

*Data Reference Source.* The BCE Monthly In-Service Work Plan Report (BEAMS Report PCN: N200252) provides monthly manhours charged by a shop cost center activity to the following LUCs:

- LUC 11, Equipment Maintenance
- LUC 12, Unit Service Calls
- LUC 13, MC Job Orders
- LUC 14, Other Job Orders
- LUC 15, MC Work Orders
- LUC 16, Direct Schedule
- LUC 18, Other Work Orders
- LUC 19, Direct Operations
- Total Direct Manhours
- LUC 22, Donated Self-Help
- Total Indirect (overhead)
- Total Hours

*Data Collection Process.* Manhours should be collected by work order activity, total direct manhours, self-help military/support, total indirect, and total hours as they appear in the actual hours column of the BCE Monthly In-service Work Plan Report.

*Data Collection Format.* Figure 3 provides a sample format for collection of manhour expenditures by work order activity.

Summary of Accomplished Work Order Activity. Army and Air Force work order activity data should be combined and integrated into the consolidated FE shop functions as shown in Figure 4. This will provide the consolidated accomplished work order activity for the base year period.

#### *Unaccomplished FE Workload*

To appropriately evaluate the total FE work requirements, determining the work order activity that was not accomplished during the base year period is also necessary. Work order requests are received by the FE organization through the last day of the base year period. Many of



Month	Overhead	Standing Operations	Service Order Jobs	Individual Job Orders	In-Shop
October					
November					
December					
January					
February					
March					
April					
May					
June					
July					
August					
September					
Total					

Figure 2. Summary of manhours by shop (FE).

Luc/ Month	11 Equip Maint	12 Unit Serv Cts	13 MC Job Orders	14 Other Job Orders	15 MC Work Orders	16 Direct Sched Wk Orders	18 Other Wk Orders	19 Direct Operatns	22 Donated & Self Hlp	Total Indirect	Total Direct
Oct											
Nov											
Dec											
Jan											
Feb											
Mar											
Apr											
May											
Jun											
Jul											
Aug											
Sep											
Total											

Figure 3. Summary of manhours by shop (BCE).

Yardstick No.	FE Function (Shop No. - Base)	Work Order Manhours			Total Direct	Overhead (Indirect)	Total Available
		50 (LUC 12 & 16)	100 (LUC 13, 14, 15, & 18)	500 (LUC 11 & 19)			
Part I - Buildings and Grounds Division (Code Series 551-630)							
Part II -Utilities Division (Code Series 551-650)							
Subtotals by FE Organization:							
Total Manhours (Sum of Subtotals)							

Figure 4. Analysis of work order activity (manhours) by yardstick.

these work requests cannot be accomplished during the survey period. To define this unaccomplished workload, the accomplished workload must be properly identified, both by volume of work orders and by manhours expended in accomplishing those work orders. An average manhour per accomplished work order can be determined and used to calculate the manhour requirement of the unaccomplished work orders. Unaccomplished work order activity is also separated into recurring and nonrecurring work categories.

The following sections describe data collection procedures for the unaccomplished work order activity.

#### Army

##### *Service Orders*

1. Data Reference Source. The Service Order Log maintained by the Work Reception and Scheduling Office within the FE organization provides the SO work order volume. Where SO work order activity is found to include nonrecurring work, grouping the actual SO work orders by nonrecurring and recurring categories will be necessary. This is unlikely, since SO work is basically repetitive (recurring) in nature. However, if nonrecurring work is prevalent in the FE organization being surveyed, a physical count and manhour summation of such work will be required. Incorporation of IFS into the FE reporting system may make output data available to meet this criterion.

2. Data Collection Process. SO volumes should be collected by shop. Included should be monthly totals of work orders accomplished during the base year period. A separate count of service orders in-progress or unaccomplished at the end of the base year period should also be recorded by shop. The accomplished and unaccomplished service order volume along with the manhour collections from the Unit Backlog and Work Force Distribution Report described previously will comprise all SO work order activity during the base period.

##### *Individual Job Orders*

1. Data Reference Source. The Individual Job Order Log and the IJO Completion Log are maintained in the Work Reception and Scheduling Office at the FE. These logs can be utilized to identify manhour and volume data for IJO work order activity.

2. Data Collection Process. Accomplished and unaccomplished work order activity should be collected for each shop. First, the work must be categorized as nonrecurring or recurring. Second, estimated and actual manhours performed within these categories should be recorded. Third, the volume of IJO requests for both IJO accomplished and unaccomplished work orders should be recorded by nonrecurring and recurring categories.



The distinction between nonrecurring and recurring IJOs can sometimes be made from the locally assigned IJO number. Where such a coding system is not used, a physical review of each document will be required to appropriately group nonrecurring and recurring IJO workload.

The data sources will allow the collection of both the manhours and volumes of IJO Requests and IJOs. The IJO Log will provide the volume of accomplished and unaccomplished work orders received during the base year. The IJO Completion Log will establish the estimated and actual manhours required to complete IJO workload by shop, and by nonrecurring and recurring work categories. IJO activity that is nonrecurring in scope will be predominantly estimated by an Industrial Engineering Standard (IE) and/or Engineered Performance Standard (EPS); these standards are used to measure work performance efficiency. To establish the efficiency factor of the work performed, actual manhours will be compared to the estimate. It should be determined whether recurring work has been estimated by EPS, or other IE standards. If recurring work is estimated by EPS/IE standards, the estimated and actual performance hours should be recorded.

3. Data Collection Format. The sample form shown in Figure 5 will facilitate the data collection process described above.

#### *Standing Operation Orders*

1. Data Reference Source. The S00 work order folder from the Work Reception and Scheduling Office within the FE will contain the estimated and actual S00 manhours.

2. Data Collection Process. Unaccomplished manhours existing at the end of the base year period are collected to identify additional FE workload requirements. To arrive at the unaccomplished manhours, the expended manhours must be subtracted from the estimated manhours. However, prior to this operation, it must be ascertained that the estimated manhours are adequately supported by Army regulations and/or technical manual criteria.

3. Data Collection Format. The suggested format shown in Figure 4 can be used to facilitate data collection of total work order activity by shop. The format provided in Figure 5 can be used for the collection of recurring and nonrecurring workload, identification of the estimated (EPS or other) actual expended manhours, and work order volume.

#### Air Force

##### *LUCs 12 and 16 (SO)*

1. Data Reference Source. The data reference source for work order manhours is the BCE In-Service Work Plan (IWP) Monthly Report, which is maintained by the IWP Programmer within the BCE Program

Shop No.	Shop Function	Nonrecurring Work			Recurring Work		
		Estimated Manhours		Manhours Actual	Estimated Manhours		Manhours Actual
		EPS	Not EPS		EPS	Not EPS	

\*It is only necessary to record recurring work that has been EPS estimated

Figure 5. Nonrecurring and recurring manhours.

Development Office. Work order volume is identified in the Service Call Log and is maintained at the service call desk located within the BCE Operation and Maintenance Office.

2. Data Collection Process. Service calls can be identified by actual performance manhours and volume of completed and unaccomplished work orders for each shop. The BCE IWP Monthly Report provides the manhour activity by shop, by LUC number, and by actual monthly hour categories. The Service Call Log provides volume data by shop for accomplished and unaccomplished service calls. If nonrecurring work order activity is included, the same procedure as described for the Army SO activity should be used.

*LUCs 13, 14, 15, and 18 (IJO)*

1. Data Reference Source. The BCE IWP Monthly Report also contains the estimated and actual manhour expenditures by shop. However, to obtain the type of estimated procedure used for work order activity, examining the document folder, which is also maintained by the IWP Programmer (except for job orders which are destroyed after input to BEAMS), is necessary. Work order volumes will be identified through the work authorization specialist who maintains the Work Order Log and the Job Order Log.

2. Data Collection Process. The RPMA work requests in this category will have been identified as Job Orders and Work Orders. The BCE IWP Monthly Report does not specify the estimation procedure. Surveying the actual work request folder will be necessary to determine the procedure. The IJO volume data will be collected from the Job Order Log and the Work Order Log to determine the volume accomplished and unaccomplished during the base year period.

*LUCs 11 and 19 (S00)*

1. Data Reference Source. The BCE IWP Monthly Report is also used for S00 reference.

2. Data Collection Process. Estimated and actual performance manhours contained within the BCE IWP Monthly Report should be recorded by FE function. The unaccomplished manhours are identified by subtracting the actual performance manhours from the estimated manhours.

3. Data Collection Format. Figures 4 and 5 show the suggested formats to be used in work order data collection.

*Overtime Manhour Expenditures by Function*

Overtime shop effort is used intermittently to accomplish work order activity. As the workload survey progresses, it will be evident that overtime effort is required of all FE shops in certain circumstances, i.e., emergency RPMA repairs, rush work order requests, etc.

Overtime manhours expended in accomplishing RPMA workload (manhours in excess of 8 hours per day) are to be categorized accordingly. The overtime manhour expenditure may be readily established by contacting the respective FE Administrative Office personnel at both Army and Air Force installations. Total overtime manhour expenditures during the base year period surveyed are to be collected by FE shop; these figures will be evaluated separately in the CMO/consolidated work order activity comparison.

#### *Total FE RPMA Expenditures*

Base year data collection of budgetary and RPMA expenditures for the Army and Air Force FE organizations is essential to analyzing consolidated FE RPMA fund requirements. Data reference sources and the suggested collection process are identified by FE organization below.

#### Army

*Data Reference Sources.* The Annual Work Plan for the base year and the Facilities Engineering Technical Data Summary, DA Form 2799-R, to be published in the Annual Summary of Operation, FY \_\_, Department of the Army, are the information sources. These sources are normally available at the Administration Office or Budget Accounting and Statistics Office within the FE organization.

#### *Data Collection Process*

1. FE Labor Cost. Unfortunately, the records currently available through the Army Management System (AMS) do not allow direct collection of FE labor cost data by FE function, as AMS categorizes costs by four general accounts:

- a. JXXXX - Operations of Utilities
- b. KXXXX - Maintenance of Facilities (Real Property)
- c. LXXXX - Minor Construction (less than \$50,000)
- d. MXXXX - Other Engineering Services (Firefighting, etc.).

Therefore, the costs by FE function must be estimated by multiplying the hourly shop labor charges times the manhours expended in work order activity (SO, IJO, SOO). The computed values can then be compared to the Annual Work Plan estimate for that function. The formula used to determine the labor rate of a shop appears in Figure 6. If the existing FE shop has an established shop rate for the base year period, it should be used in lieu of formula computations made at the time of survey. Where more than one shop rate was in effect during the base year period, a weighted average of the two should be used. Shop rate averages of each CMO FE shop should be incorporated into the related consolidated organizational function and presented in yardstick sequence.



Shop _____	Type Leave	# Employees
Annual Salary _____	Sick	@ 70 hrs =
	4 Annual	@ 104 hrs =
	6 Annual	@ 160 hrs =
	8 Annual	@ 208 hrs =
	Holidays	@ 72 hrs =
	Mandatory Meetings, Admin 3, and Conferences	@ 32 hrs =
	_____	_____
	Total Leave # Employees + Average Leave Time	
Available Hrs Per Employee Per Year 2,080		
Less Average Leave and Holiday Time _____		
Average Working Time Per Employee _____		
Working Time for _____ Craftsmen		
_____ Less _____ Supervisors(s) _____		
Average Effective Rate per Hour: _____		
Overhead/Cost Code 112 (Effective Rate) _____		
Hourly Rate _____		

Figure 6. Shop rate formula.

2. Supplies/Materials. Supply and material costs for individual FE shops are not available. However, the FE Work Coordination Office is normally able to develop a percentage of supply and material utilization, by shop, in terms of direct labor. Supply costs can then be estimated for each FE shop. A line-item count is also required to determine the workload of the Supply and Storage Division. Each transaction of supply (receiving, issuing, shipping, and documenting property records) equals a one-line-item count.

3. Contracted Workload. Contract costs are chargeable to one of four AMS general accounts. Although identifying contract costs by functional area within AMS accounts is not possible, the total costs chargeable to these accounts can be identified. The data collection process should include a listing of FE-related contracts let during the base year period by type and by dollar value. In addition, the total cost of in-house projects designed and completed during the base year period, annual construction costs of projects designed for the FE by Architectural and Engineering (A-E) contract, and estimated costs of projects approved (the Annual Work Plan) upon which design has not been completed or initiated must be collected.

*Data Collection Format.* The suggested format to be used in collecting the actual RPMA expenditures for the base year period includes cost data appropriate to the following categories:

1. Total labor cost - military/civilian
2. Total supplies cost
3. Total contract cost
4. Total other
5. Total RPMA expenditures.

#### Air Force

*Data Reference Sources.* The Program Element Summary, FY\_\_ Operations, Operating Budget for RPMA report and the RC Manager Cost Center Report (BEAMS PCN:N370543) provide Air Force expenditure data. These sources are available from the BCE Program Office.

*Data Collection Process.* Operation and maintenance costs are estimated annually as shown in the operating budget for the base year RPMA program. Total RPMA expenditures for the base year are accumulated as reflected in the RC Manager Cost Center Report, which shows costs against approximately 500 Element of Expense/Investment Account Codes (EEIC) that can be grouped into seven categories:

1. 1XXXX - Materials and supplies
2. 2XXXX - Military pay
3. 3XXXX - Civilian pay
4. 4XXXX - Travel, transportation expense/purchase utilities
5. 5XXXX - Contracts
6. 6XXXX - Supplies/material issue
7. 7XXXX - Motor vehicle and miscellaneous costs.

BEAMS collects expenditures chargeable to each organizational element identified as a Responsibility Center/Cost Center (RC/CC) and allows the direct collection of information related to the RPMA workload by function.

*Data Collection Format.* The format used should include the categories identified for the Army data collection format.

#### CMO Manpower

For the purpose of data collection, manpower resources of an FE organization should be identified as in-house and out-of-house support. The major areas of labor data collection are the RPMA manpower requirement by function, the on-board labor classifications by type, the RPMA labor resource from troop support, and the respective cost elements by function.

#### *In-House FE Manpower*

RPMA manpower requirements by function include data for the recommended, recognized, authorized, FE-assigned, and on-board staffing levels. Within the staffing levels, manpower is designated by function.

The labor resources should be identified as civilian, military, and temporary appointments. Nonsupervisory and supervisory distinctions are needed to determine the manpower resources and the degree of supervision utilized. Direct labor and administrative support distinctions are needed to determine the ratio of direct labor to administrative support. These values allow comparative analysis of the effects of various staffing levels and/or staffing alternative strategies on organizational efficiency. Military manpower is considered a separate category because of the various types of military support. In-house military manpower provides resources to accomplish the RPMA workload.

The organizational charts of the Army and Air Force FE organizations are useful guides for surveying the manpower requirements by each functional area.

FE In-House. Manpower records for the various staffing levels should be obtained from the FE Administrative Office and retained for backup documentation.

*Recognized Staffing Level.* The FE initiates the Manpower Survey Report - Schedule X - Manpower and Workload Data, Standard Form 140-4. The FE establishes the staffing requirements and provides manpower documentation to the manpower survey team. Based on this documentation, the manpower survey team determines the actual recognized staffing level. This report provides a good overview and explanation of the present manpower justification. The latest report should be used since the manpower survey is not performed annually. The data required to be collected from this report include the total manpower staffing levels for each identified function recommended by the FE and the total manpower staffing levels for each identified function determined by the manpower survey team.

*Authorized Staffing Level.* The authorized staffing level can be obtained from the monthly Personnel Section Report. Since the authorized level fluctuates, a copy of each report during the base year period should be obtained. The data to be recorded are the average of the monthly authorized manpower level for each identified function.

*Army On-Board Manpower Level.* The on-board labor observed during the base year period represents total man-year effort dedicated to the RPMA program by in-house manpower resources. Identifying and recording the manpower as supervisory and nonsupervisory man-years is important. A further distinction between civilian and military appointments is also necessary. Staffing must be collected for each function of the FE organization. These data are available from the administrative division of the FE organization.

Properly identifying all the man-year effort utilized by the RPMA organization within the base year period is important. For instances where a position has been partially filled, a weighted average of the time expended on the job should be computed for the base year period; e.g., a 6-month appointment would be computed as .5 man-years, provided the position remained vacant during the remainder of the base year period.

*Recording Format.* The data obtained for the recognized and authorized staffing levels should be recorded on forms similar to that shown in Figure 7. The on-board staffing level should be recorded in the format provided in Figure 8.

BCE In-House. The manpower records required to document the Air Force staffing levels are located at the Administrative Office.



<u>Yardstick Code</u>	<u>FE Function</u>	<u>Staffing Levels Recognized</u>	<u>Authorized</u>	<u>Workload Factor for Manpower Determination</u>
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TOTAL	_____	_____
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Figure 7. Base year staffing appraisal criteria.

<u>Function No.</u>	<u>Organizational Title</u>	<u>Supervisors</u>		<u>Non-Supervisors</u>		<u>Man-Years</u>		<u>Total</u>
		<u>Civ.</u>	<u>Mil.</u>	<u>Civ.</u>	<u>Mil.</u>	<u>Temporary</u>	<u>Appts.</u>	

Figure 8. On-board base year FE staffing.

*Air Force Recommended/Authorized Staffing Level.* The Air Force does not have a staffing allocation called "recognized," but rather a recommended or requested level. The authorized staffing level can be obtained from the Base Civil Engineering USAF Manpower Standard, Standard Application Form No. CE-MET 1. This summary form provides the positions requested by the BCE Commander and the Unit Detail Listing (UDL) of personnel authorized. The UDL is also produced quarterly by BEAMS (PCN: TE75FOA) to provide an eight-quarter (2-year) projection of the increases and/or decreases in authorized positions to reflect program changes. The UDL can be used to verify the Standard Application Form for an accurate and appropriate authorized staffing level by function (work center) and position classification.

The data obtained by work center for personnel requested by the BCE and UDL authorized staffing should be recorded in the format shown in Figure 7.

*Air Force On-Board Manpower Level.* The procedure for collecting and recording on-board manpower data is the same as for the Army (Figure 8).

Combined On-Board Base Year FE Manpower. The on-board base year FE man-year efforts dedicated to the RPMA program from in-house resources for each FE organization should be combined. Nonsupervisory and supervisory man-years should be combined by their respective FE organizational functions and integrated into the staffing guide's organizational structure (Figure 9). Administrative and direct labor man-year totals should then be designated and arranged accordingly, as shown in Figure 10.

#### *Military Manpower In-House*

The military in-house support to both the Army and Air Force FE organizations should be identified from the on-board staffing level survey. The UDL for the Air Force provides the rank for military classifications. Identifying and describing the type of military support available to the FE is important; the manhours available, position classifications, and rank should be recorded.

The military in-house support should be included on the Personnel Strength by FE Function Form (Figure 8).

#### *Out-of-House Manpower Support*

At least four possible resource areas which supply external labor support to the FE organizations must be examined. The required data are available at the FE and BCE administration offices. The data collection requirements are the same for Army and Air Force.

Interservice Support Agreements (ISSA). ISSAs should be identified and documented for the base year period. Preparing a brief description

Yardstick Code 551 -	FE Organization Function	FE Organization		FE Organization		Combined Total	
		Nonsupvy.	Supvy.	Nonsupvy	Supvy.	Nonsupv	Supvy.
			<u>Total</u>	<u>Total</u>	<u>Total</u>	<u>Total</u>	<u>Total</u>

Figure 9. Combined on-board base year FE manpower.

Yardstick				
Code	FE Organization	FE Organization	FE Organization	TOTAL
551-	Function	Admin. Staff	Admin. Staff	Admin. Staff
		Direct Labor	Direct Labor	Direct Labor

SUBTOTAL  
TOTAL

Figure 10. Comparison of on-board administrative staff to direct labor.



of each agreement, including the annual cost and/or manhours requirement, is necessary. Data should be recorded in the format shown in Figure 11.

Military Manpower Out-of-House. Military out-of-house support need not be incorporated into the consolidation analysis if it is assumed that this resource will always be available to the FE organizations and to the consolidated organization. This is the best assumption unless a decision has been made as to the disposition of the military support.

Contract Labor. The data requirements for contracts were covered in the CMO Workload section of this chapter.

Installation Support Agencies. FE requirements for services provided by installation support agencies are not usually large enough to justify in-house capabilities. The installation support data to be collected are discussed in the Installation Support section of this chapter.

#### *Manpower Cost Determination*

Grade/step/series levels, annual salary costs including fringe benefits, and premium pay by nonsupervisory/supervisory positions for each functional area must be identified to determine in-house RPMA manpower costs for the on-board staffing allocation during the base year period. The cost of the vacant positions within established grade levels for each function must then be added to this cost to determine the total manpower costs. These total manpower costs for nonsupervisory and supervisory categories are divided by the total number of positions identified to obtain an average nonsupervisory or supervisory salary for each FE function.

Personnel records from the Administrative Office of the FE organization contain the grade/step/series levels of all personnel by function. Vacant positions with established grade levels (using step one of that grade) are to be included by function within the grade structure.

Base year salary scales for general schedule, military, and wage grade personnel must also be obtained from the FE Administrative Office. These salary scales will permit calculation of the actual salary cost based on the grade and step levels for the base year period. The end-of-survey-year records should be utilized.

The Administrative Office will provide the fringe benefits percentage appropriate for the FE organization being surveyed. Fringe benefits include costs of leave, health and life insurance subsidies, retirement, etc., to the FE organization. The percentage of fringe benefits is calculated by dividing the total fringe benefit cost by the total salary cost.

Agreement No.	Description	Supplying Activity	Receiving Activity	Approx. Annual \$	Comments
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Figure 11. Existing support agreements (ISSAs).

Premium pay is generally attributable to Fire Protection and Prevention Division personnel; the budgetary personnel within the FE organization should have this percentage available.

The formats used in recording and averaging the FE manpower cost factors are shown in Figures 12 and 13.

### Installation Support

The method of accounting for work accomplished by support agencies at Army and Air Force installations does not lend itself to identifying the exact amount of support provided to the FE organization, since the man-year or dollar effort is not usually recorded. Determination of the exact amount of support would require a new accounting system in each support agency, which could be a very time-consuming and costly effort. However, identifying support through other, less exact means is possible. Manpower survey techniques should be used to establish the amount of support. If installation manpower analysts are available, they can help to establish personnel requirements based on workload. However, the survey team may have to rely on estimates from each agency. Some agencies can approximate the amount of support given to the FE/BCE by comparing a known volume of work for the FE/BCE to the total volume of that type of work accomplished for the installation and applying that ratio to the manning of the support agency. In other cases, individuals within the support agency must estimate the support.

It should be noted that throughout the identification of installation support, the costs of office supplies which an installation agency uses are rarely identifiable, and therefore cannot be included in support figures. It is, however, reasonable to assume that these costs are negligible in administrative functions and become significant only in areas such as printing or computer services where paper is a major agency cost. The supply and material costs which are identifiable should be recorded as other costs.

Wherever possible, estimates derived from two or more sources should be compared. Significant differences may be due to an improper estimate by support personnel or to special requirements in the relationship of the FE/BCE to the support agency. These differences must be logically resolved in order for the investigator to determine the appropriate support figures. Where separate source estimates do not differ significantly, the estimates, even though subjectively determined, tend to validate one another. Where it is not possible to identify separate sources of estimates, the investigator must insure the completeness of support considered and decide on the validity of the estimate. One approach to validation is to discuss the estimate of support with the appropriate personnel in the supported FE organization. These people are normally aware of the amount of support received and will be able to detect gross errors in estimated support and the areas in which further attention may be required. Where errors are detected, it is usually possible to resolve differences between FE and support personnel.

[illegible]

Figure 12. Base year manpower cost (on-board end FY).

Yardstick Code	FE Function & Organization	Total CM0 Salaries Nonsupv.	Supv.	Total Observed Man-Years Nonsupv.	Supv.	Average Salaries Nonsupv.	Supv.
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Figure 13. Average nonsupervisory and supervisory salaries.



In many instances, the amount of support identified as being offered by these agencies will not equal the amount of savings which can actually be realized if FE/BCE requirements were removed. This is due primarily to partial man-year requirements and the fact that some agencies may be already manned at the minimum staffing requirements. In these cases, both estimated support requirements and realizable support savings should be identified.

Realizable support is the agency's estimate of what support costs or man-years could actually be transferred or eliminated if the FE/BCE requirements were removed. The retained support is the difference between the estimated total requirement and realizable requirement and represents the amount of support identified for the FE or BCE which must remain within the installation agency even though it is not providing services to the FE/BCE. The realizable support for each agency should be determined when FEDFAE/BCE support is determined. If manpower analysts are available, they should be able to resolve the realizable support problem rather than obtaining estimates from the agencies.

A discussion of each area in which significant support will normally be found and the probable source of estimates in that area are presented below. Each installation must be surveyed to identify the appropriate agencies which support the engineering organization. The costs should be computed with and without fringe benefits.

#### *Comptroller*

Comptroller personnel at the branch level must estimate the amount of time spent in processing financial documents for the FE/BCE. Breaking down the comptroller activities into individual functions and determining both civilian and military man-years and cost in support of each function may be useful. A sample format is shown in Figure 14. Time spent in processing FE documents may then be applied to the salaries of the average grades of personnel in the section to arrive at the cost of support. A separate source estimate is not available unless a particular section maintains data on the numbers of actions processed for each customer.

#### *Communications*

On installations where the telephone system is government-owned, no reimbursable costs are incurred by the FE organization for telephone service. Communications personnel can determine the number of main lines, extensions, and other equipment used by the FE from existing records. The monthly cost attributed to the FE can then be estimated using the current classification and rental rates in AR 105-23.<sup>19</sup> A cost summary should be prepared by unit cost for each type of equipment.

<sup>19</sup> *Administrative Procedures for Communication Services*, AR 105-23 (Department of the Army, 28 July 1975).

Activity	Total Estimated Manpower			Realizable Manpower Support		
	Man-years		Costs	Man-years		Costs
	Mil	Civ		Mil	Civ	
Accounts Control						
Military Pay						
Civilian Pay						
Travel						
Commercial Services						
Paying and Collecting						
Audit						
Budget						
TOTALS:						
Without Fringe:						

Figure 14. CMO Comptroller support for each installation.

Each piece of special equipment used by the FE is subject to an additional charge. The amounts and types of special equipment can be determined by performing a physical inventory of each line, but this can be an extremely time-consuming venture for an FE of any significant size. In lieu of this inventory, communications personnel can usually estimate the amount of special equipment involved and the associated monthly charge. Telephone installation and moving services are performed on an as-required basis and are charged separately. An estimate of the volume of telephone service calls can be obtained from communications personnel to account for these services.

On installations where the telephone system is commercially owned and operated, communications personnel can provide the average monthly charge for FE phones based on actual charges.

Extracting charges for long distance calls is not possible. Two systems, AUTOVON and WATTS, are available to FE organizations. No record is maintained as to originator, destination, or duration of calls placed through these systems, and, therefore, no costs can be calculated.

The cost of communication personnel in support of the FE/BCE is considered insignificant and is not included in the cost determination.

#### *Civilian Personnel Office (CPO)*

The number of man-years expended in support of the FE/BCE can be approximated by applying the ratio of FE/BCE civilian personnel to the total civilian work force at the installation to the manning of the CPO. CPO personnel must review and modify this figure in light of local conditions such as abnormal turnover. An additional cost which must be recognized and estimated is the cost of CPO services to the installation support offices which support the FE/BCE. Before requesting this figure, the man-years support to the FE/BCE from all other support agencies must be identified. The total man-years of support can then be multiplied by an average grade salary to determine the cost.

#### *Management Information Systems Office (MISO)/Data Automation*

Computer hardware in these agencies may be government-owned, leased from commercial sources, or a combination of these two procedures. Where the hardware is leased, actual rental charges may be used to compute a part of the cost. If records are maintained on the amount of direct computer time attributable to each customer, the ratio of FE direct time to total direct time can be computed. This ratio can be multiplied times the rental charges to obtain the FE computer cost. Actual rental charges for dedicated systems such as remotes and servicing lines must be added as an additional cost. The amounts and costs of manpower and supplies attributable to the FE can then be estimated by support agency personnel using the direct time ratio as a guide.

Where hardware is wholly or partially government-owned, costs of operation and maintenance may not be totally recoverable. In addition,

if the amount of direct time used by each customer is not recorded, extracting FE-attributable costs will not be possible, even if the total hardware costs are known. If one of the two above conditions exists, estimating will be necessary. Similar commercial hardware rates could be used to estimate the cost of support.

Under the CMO, the Air Force and Army have different RPMA management information systems. The Air Force currently utilizes the BEAMS, introduced during the late sixties. Army installations are implementing the IFS. At Army installations where IFS has not yet been installed, the CMO data must be calculated assuming that IFS is in use, since it will be implemented whether or not consolidation of RPMA takes place. This will allow valid comparison of data automation support costs before and after consolidation. Machine-run time for IFS support may be estimated with the help of the IFS Field Support and Training Branch, DAEN-FEM, Fort Lee, VA.

#### *Adjutant General/Base Administration*

The figures for support rendered in the distribution/management services and issue of forms and publications can be calculated by determining the percent of total accounts serviced for these activities which applies to the FE organization. The percentage of the on-board staffing in the above areas can be used to compute the related manpower and costs. This percentage must be reviewed by support agency personnel and modified to provide for any variance of support to the FE. The FE organization may, for instance, use more forms than the average customer. Breaking down support into individual activities, as shown in Figure 15, may be helpful in arriving at total support.

Some printing plants are required to periodically compute the cost of printing per production unit. This cost includes personnel and supply costs as well as equipment depreciation. Where this is done, the volume of production units accomplished for the FE during the base period may be extracted from printing logs, and the cost computed. Where the cost per production unit is not maintained, the total number of production units accomplished, average number attributable to the FE organization, quantity of supplies required per production unit, and salaries of printing personnel are normally known. These factors can be used to calculate printing costs.

The cost for printing accomplished by commercial firms under service contracts is available in printing plant records.

Where copy service is provided by a service contract, the number of copies made is reported by customer units to the installation administrative office for the purpose of monitoring costs. This number of copies and the contract bid price per copy should be used to compute copy service cost.



<u>Activity</u>	<u>FE Organization</u>	
	<u>Man-years</u>	<u>Cost</u>
Pub/Forms Management		
Pub/Forms Supply		
Reproduction - In-House		
- Commercial		
- Copy Service		
Distribution		
TOTALS		

Figure 15. Adjutant General/Base Administration support.

### *Installation/Base Supply*

Since the vast majority of supply actions for the FE are accomplished in-house or by DIO procurement personnel, the amount of support received from the Installation Supply Office (ISO) is very small. Due to the self-service nature and infrequent FE use of some ISO services, extracting the exact amount of support received is not possible. ISO personnel can normally estimate the number of hours per activity spent in support of the FE. This estimate times an average hourly wage rate will provide the cost.

An estimate of support provided to the BCE by Base Supply can be developed from the Base Supply machine listings. The number of transactions required annually can normally be recovered. This volume can then be compared to the total number of line items managed by Base Supply. Care must be exercised to insure complete reporting. Nearly all the branches and sections within the Base Supply Office interact with the BCE. Individual section support effort may be a small portion of a man-year, but the sum of these efforts can yield a significant amount of Base Supply Support.

### *Procurement*

The volume and cost of all construction and service contracts and those administered for the FE are readily available from the records of the Procurement Division of DIO. The annual volume of local purchase actions accomplished can be provided by the FE Supply and Storage Division. These volumes can be used by DIO Procurement personnel to approximate the number of people required to support the FE. Figure 16 shows a sample breakout of costs. Since the FE is normally a large consumer of procurement activities, it may be found that individuals within the Procurement Division are virtually dedicated to FE service and may be specifically identified as such. The amount of administrative and supervisory effort must then be estimated.

The volume of contracts administered by Base Procurement for the BCE can be extracted from procurement files. Assistance from Base Supply will be required to estimate the number of local purchase procurement actions accomplished for the BCE. Since the BCE is not a customer of Base Procurement, but must pass all actions through Base Supply, these volumes are then applied to the most recent staffing guide for procurement to determine the amount of support.

### *Transportation*

Army general-purpose vehicles used by the FE are provided, maintained, and dispatched by the TMP. The total cost of support can be obtained by applying the rate per mile, which is computed and maintained by TMP, to the total number of miles driven by the FE fleet. The mileage figures should be obtained at the same time TMP vehicle utilization data are recorded (as discussed in the Equipment Section of this

Personnel	GS Level	Man-years
Buyer, Supervisor		
Buyer		
Typist		
Non-dedicated		
<hr/>		
TOTAL		
Estimated Cost		
<hr/>		
Procurement Actions	Actions/Month	
<\$10,000		
>\$10,000		
Contracts		
<hr/>		

Figure 16. Current procurement operations.

chapter). Fleet mileage is reported to the TMP and analyzed quarterly. TMP personnel can estimate what part of the total cost is attributable to direct labor, parts and materials, and overhead. A good starting approximation is to compute the ratio of FE TMP-furnished vehicles to the total TMP inventory and apply this ratio to the annual salary and parts costs for TMP. It will probably be found, however, that the support rendered to the FE is less than the straight proportion would indicate because the TMP assigns the vehicles to the FE on an almost permanent basis for the same shops and often the same operator. This system requires less management and maintenance than other TMP operations.

All vehicles used by the BCE are furnished through and maintained by Base Transportation. All work accomplished by Base Transportation maintenance shops is accounted for in various automated reports known as the Vehicle Integrated Management System (VIMS). Base Transportation personnel can query existing data files to obtain information on annual personnel and materials costs charged against BCE accounts. The vast majority of transportation support is in this area. Due to the permanent assignment of BCE vehicles, support from other branches of Base Transportation will probably be found to be insignificant or not identifiable.

#### *Movements*

The Movements Branch, Transportation Division (DIO), is responsible for the processing of all shipments. It is unusual for an FE organization to have outbound shipments, and a quick check of movements files will verify this. For inbound shipments, a physical inventory must be made to extract the total number of inbound Government Bills of Lading (IGBLs) processed and the number attributable to the FE. The ratio of FE IGBLs to total IGBLs should be applied to the staffing of the Movements Branch and the salary of the branch average grade to determine the volume and cost of support.

#### *Material Maintenance Division (MMD)*

MMD provides support maintenance to the FE as requested on DA Form 2407 (Maintenance Request). These forms are retained by MMD for a period of 90 days after accomplishment. A physical inventory of the files can be made to extract all DA Forms 2407 attributable to FE. Machine runs attached to the 2407 will show the number of manhours charged and personnel and equipment costs for that job. These figures are then summed by type of job to give the amount of support rendered for the quarter. Sections in the FE, such as the M&S Equipment Shop, maintain record logs of maintenance requests submitted to MMD; the annual volume can be obtained from these logs. Other sections, such as Work Coordination, which uses MMD for machine shop fabrication of non-standard or unavailable materials required for accomplishment of IJOs, may not keep logs of submissions but can estimate fairly accurately the number submitted annually. Actual expenditures for services provided



under commercial contract can be extracted from vouchers available in MMD files. The quarterly support figures can be extrapolated using these volumes to arrive at an annual support cost.

#### *FE/BCE Functions Versus Support Functions*

Before final analysis, it must be recognized that offices within the FE/BCE may be providing personnel time and costs toward the accomplishment of functions identified as being provided by support agencies. The FE/BCE functions which are extensions of support functions have been identified in the CMO Manpower section and should be noted as duplicative records. Functions where these additional costs may be expected are the Comptroller (through the FE/BCE Budget, Accounting, and Statistics Branches) and Supply (through FE/BCE Supply Offices).

#### *Summary*

The areas discussed above are those in which significant support is normally found. Other areas may require an initial investigation. Military and Air Police provide support to the FE organizations, but identifying support specific to the FE/BCE is not usually possible. For example, it is impossible to determine what portion of normal police patrolling is attributable to a specific agency.

It would be unusual for the installation's major unit staffs to provide support to the FE organization, but this possibility should be checked before rejection.

It is important to remember throughout the identification of installation support that a consolidation study will require the investigator to project the amount of support which a consolidated organization would require, and in some areas, staff the organization for in-house accomplishment of what are normally external support activities. This will require knowledge of the kinds of activities performed by each support agency. The best sources of this information are the support agency personnel contacted for data; considerable time can be saved by accomplishing both objectives simultaneously.

The installation support for each installation can be summarized as shown in Figure 17.

#### Equipment

The cost analysis must determine any savings or cost avoidance resulting from the combining of equipment requirements. Projecting the consolidated requirements and determining cost savings requires an in-depth analysis of the types and quantity of equipment currently required by the FE organizations. The backup data to be collected will include an inventory listing of FE equipment, acquisition data, and utilization data.

Ydstk. Code	Function	Estimated Support a	Realizable Support b	Retained Support c(a-b)
60	MISO/Data Automation Man-years Personnel Cost Other Cost Total			
100	Comptroller Man-years Total (Pers'l Cost)			
220	AG/Base Administration Man-years Personnel Cost Other Cost Total			
270	Civilian Personnel Man-years Total (Pers'l Cost)			
520	Supply Man-years Total (Pers'l Cost)			
530	Procurement Man-years Total (Pers'l Cost)			
560	Transportation Man-years Personnel Cost Other Cost Total			
562	Movements Man-years Total (Pers'l Cost)			
570	Material Maintenance Man-years Personnel Cost Other Cost Total			
700	Communications Total (Other Cost)			
	Totals Man-years Personnel Cost Other Cost Total			

Figure 17. CMO installation support.

### *Inventory of Equipment*

Each military installation maintains property, utilization, and historical or registration records for equipment. The detail and completeness of these records vary from service to service and from FE organization to FE organization. The various equipment records are maintained by property control sections, vehicle controllers, and divisions, branches, or shop offices assigned equipment. FE has a property officer to control all the equipment owned by the FE. The BCE does not own any equipment. The Base Supply and Transportation Office maintains property control of equipment used by the BCE. Inventory can be extracted from the Base Supply Report, Custodian Authorization/Receipt of Products (R-14/902-44) and other listings provided by the Base Supply Office.

The inventory required by this analysis is not an actual physical count of the equipment, but rather an identification of equipment available according to the maintained records. The equipment should be identified and categorized by type; i.e., General Purpose, Special Purpose, Shop, or Office.

Within each equipment-type category, the assigned identification number for each item of equipment, if applicable and available, should be recorded along with a brief description, i.e., sedan, crane, pickup, grader, etc. The descriptive information should be carefully recorded, since the FE records are often inconsistent in supplying identification numbers. The shop and office equipment types usually do not have a unique identification number assigned (some expensive items have identification numbers); they have only the National Stock Numbers (NSN), which are not useful for obtaining acquisition data.

The Army and Air Force use the NSN to identify special-purpose (SP) equipment. Since the NSN is the same for identical equipment, it is not a useful identification number for this analysis and need not be recorded. The Army also uses a line item number to identify SP equipment. This number is used on nearly all the records kept by the FE.

The data collection requirements are described below by type of equipment. Figure 18 can be used to record the basic inventory data (Completion of columns l, m, and n is described in Chapter 5.)

#### *General Purpose (GP) Vehicles*

The vehicle inventory includes those vehicles supplied to the FE by the TMP of DIO and those vehicles supplied to the BCE by the Base Transportation Office. The GP vehicles include sedans, station wagons, pickup trucks, vans, etc.

Army TMP Vehicles. The basic inventory data required must be obtained from TMP. The TMP Vehicle Quarterly Analysis Report provides a description of the vehicle and its location. Although the section/shop

Figure 18. Equipment inventory data.



within the FE may not be listed, DIO or the FE can provide this break-out.

Acquisition data are not found on the Quarterly Analysis Report but can be obtained from TMP property records and utilization records. Identifying the year manufactured and cost for each vehicle is necessary.

TMP utilization data, which can be obtained from the Quarterly Analysis Report, are recorded as idle days and maintenance days. The idle days are the days the vehicle was available but not used. The maintenance days represent the downtime for the vehicle. All four of the Quarterly Analysis Reports for the base year period are needed in order to obtain a total for the idle and maintenance days. This may pose a problem, since the reports are usually only retained for a 1-year period. If any of the quarterly reports are not available, the idle and maintenance days for the base year must be projected.

Air Force Base Transportation Vehicles. The basic inventory data required for Base Transportation vehicles can be obtained from the Custodian Authorized/Receipt of Products Report (R-14/902/44) provided by Base Supply. This equipment list has a description of the vehicle type and vehicle identification number, but does not list them by shop or cost center. The Operations and Maintenance Cost Center at the BCE organization can provide a list of vehicle types by cost center which can be cross-referenced to the Base Supply reports by vehicle registration number.

This report also contains acquisition data. The first two characters of the vehicle registration number are the year manufactured, and the unit price provides the acquisition cost.

Utilization data are not provided on the Base Supply reports, but the Cost Accounting Section in the BCE organization can often provide the required information for each vehicle from the Monthly Mobile Equipment Use Records, AF Form 1447. The AF Form 1447 provides the hours available, downtime, and hours used.

#### *Special-Purpose (SP) Vehicles*

An inventory should include all the vehicles listed on the property records as "owned" by (Army) or strictly dedicated to (Air Force) FE organizations. These vehicles include specialized trucks, cranes, bulldozers, graders, etc.

Army SP Vehicles. The inventory data required for the analysis of SP vehicles are available from the vehicle log books, which are usually located in the FE M&S Equipment Shop. The Equipment Acceptance and Registration Record, DA Form 2408, contained in each log book gives the nomenclature, including make and model, line item number, identification number, location, year manufactured, and sometimes, acquisition cost. If the cost is not available, it can be obtained from the Installation



Property Record, DA Form 3329 (by line item number). The Hand Receipt, DA Form 2062, maintained by the Property Book Officer, can also be used to locate data that may be missing on DA Forms 3329 or 2408. The make and model numbers must be recorded for construction equipment, such as dozers, cranes, etc., in order to identify the current value of the equipment. If the total operating hours from the date of acquisition are available, they should be recorded. This will probably be impossible for equipment over 2 years old, since utilization records are normally only maintained for 2 years.

Utilization data can be obtained from the FE Maintenance and Services (M&S) Equipment Utilization Report (FORSCOM Form 590-R or equivalent), which is usually maintained in the Buildings and Grounds Branch. This report is submitted on a quarterly basis for each item of SP equipment; the quarterly reports are totaled at the end of the fiscal year. (FORSCOM Forms 590-R are kept for 2 years.) This report is filed by line item number and data can be located easily by identification number. The data to be recorded from this report include downtime, available time, hours used, and maximum hours available for the base period. The maximum number of available hours for equipment utilization for the base period is 2000 hours/year; however, vehicles which have a seasonal requirement or a predetermined shorter utilization period have the utilization hours adjusted downward.

The method of data extraction given below is considered the most effective, since the property book officer must maintain records on all equipment until the actual disposition date. When using the DA Form 2408, only the data for vehicles being utilized should be extracted.

#### Log Books (DA Form 2408)

1. Nomenclature
2. Make and model (on construction type equipment only)
3. Line Item Number
4. ID number
5. Location (shop)
6. Manufactured Year
7. Acquisition cost (If cost not available, use Line Item Number and go to Step 2.)

#### Installation Property Record (DA Form 3329)

1. Acquisition Cost (if not in log book)

FE Maintenance and Service (M&S) Equip. Util., FORSCOM Form 590-R equivalent

1. Downtime
2. Available
3. Hours used

Air Force SP Vehicles. Air Force SP vehicles should be of the same types as Army SP vehicles, i.e., cranes, bulldozers, and other FE specialized vehicles. Since Air Force SP vehicles are exclusively used by the BCE organization but are on the property records of the Base Transportation Office, the BCE organization does not have a property officer. Data should therefore be obtained from Base Transportation.

The acquisition and utilization data should be obtained from the same sources and at the same time as the GP vehicle data. The nomenclature, make and model number, and identification number for construction-type vehicles should be obtained from the Vehicle Historical Record, AFTO Form 271. Utilization data can be obtained from the Monthly Mobile Equipment Use Record, AF Form 1447, for each item of equipment. This form shows available time, downtime, and hours used. AF Forms 1447 are usually maintained by the Cost Accounting Section and are kept for a period of 2 years.

#### *Shop Equipment*

The shop equipment inventory should be separated into two categories: equipment with value greater than or equal to \$1000 and equipment with value less than \$1000.

Army Shop Equipment. Shop equipment data can be obtained from the Hand Receipt (HR), DA Form 2062. The equipment should be recorded by Hand Receipt number, nomenclature, number of items, and stock number. The acquisition cost and data (if available) can be obtained from the Installation Property Record, DA Form 3329, by identifying stock numbers. Both the DA Form 2062 and DA Form 3329 are usually available from the Property Book Officer in the Supply and Storage Division. The suggested data collection procedure is provided below.

#### Hand Receipt (DA Form 2062)

1. HR number by shop
2. Nomenclature
3. Number of items
4. Stock number

#### Installation Property Record (DA Form 3329)

1. Acquisition Cost/Item
2. Acquisition date

The utilization data are not usually recorded, but at least an estimate should be obtained. Each shop foreman should be interviewed to obtain the best estimate of the hours available, the hours used, and downtime. This is a subjective procedure which requires that the most knowledgeable shop personnel make the estimates.

Air Force Shop Equipment. Shop equipment data can be obtained from the equipment listings provided by a Base Supply report, Custodian Authorization/Receipt of Products. The Tool Kit Custody Receipt Listing (R09/81212) can be used to determine the amount and value of tool kit inventory. The acquisition cost, which is available from this listing, should be recorded. Base supply can provide the acquisition data on this listing, if available.

The utilization data should be obtained by following the procedure described for the Army shop equipment.

#### *Office Equipment*

The office equipment inventory should be recorded as either office furniture or office machines.

Army Office Equipment. The inventory and data required for office equipment are listed on the Installations Property Record and the Hand Receipts. The equipment should be recorded by shop in the two office equipment categories. The data extraction procedure should be the same as for shop equipment.

The acquisition data can be recorded from the Installation Property Record. However, if the acquisition date is not available, general description, cost, and the number per shop should be recorded.

Utilization data are not maintained for this type of equipment.

Air Force Office Equipment. The Air Force equipment listing from Base Supply for the BCE organization should list the office equipment. To this listing should be added estimates of the value of all excluded equipment and furniture.\*

Acquisition data should be recorded from this listing. The nomenclature, cost, and number of items are recorded. Acquisition date (if available) can be furnished upon request.

Utilization data are not maintained.

#### *Operation and Maintenance Cost*

One of the assumptions of this analysis is that the workload is the same for the CMO and the consolidated organization (base year data). Since the O&M expenses are a function of utilization, they will be the same as for the CMO and the consolidated organization. The smaller

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\*The Air Force does not account for items with a cost of less than \$40.00, while the Army does not account for items costing less than \$25.00.

consolidated equipment inventory will have a lower depreciation expense than the CMO inventory; the value of the difference in the inventory level is recoverable at the time of consolidation, and no other downstream benefits occur.

### Space Requirements

The FE/BCE maintain files of as-built drawings of buildings on the installations. Floor plans for structures occupied by the FE/BCE can be obtained from the engineering section of the respective organization. These structures can then be surveyed to determine changes in the floor plan and what activity is occupying the space. Observations and interviews with personnel must be used to determine whether the space is adequate, is being used efficiently, is suitable for other purposes, and is flexible enough to absorb additional activity.

Facilities within the FE/BCE can be divided into three general structural groups: administrative, shops, and storage/open storage/parking. These groups must be identified as such, since post-consolidation utilization of any area is generally more efficient if the area is used for the same purpose as at present.

### Utilities

Utility requirements, user consumption rates, and utility costs (to include operation and maintenance) are the essential data elements. The utility requirements of FE organizations normally includes such resources as electricity, liquid propane gas, natural gas, fuel oil (Numbers 2 and 6), coal, water/sewage, and other externally supplied utilities such as alarm systems (not including telephones, which are included under installation support).

The user consumption rates are identified by specific units of measure such as Btu, kilowatts, gallons, etc.

#### *Data Reference Sources*

Army. Individual records are maintained on each utility and are normally available from the Administrative/Budget Office within the FE.

Air Force. Utility data can be provided by the Cost Accounting Office within the BCE organization.

#### *Data Collection Format*

Since the Army and Air Force maintain similar records, the data collection format should be applicable to both services. A utility summary format should be used in collecting utility consumption rates and utility costs as related to each utility resource. The sample format shown in Figure 19 will facilitate data collection for the base year period.

<u>Utility Type</u>	<u>Unit of Measure</u>	<u>Utility Consumptions</u>	<u>Utility Costs</u>	<u>Customer User Rates</u>
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Figure 19. Utility summary, FY\_\_\_\_.



## 5 ANALYSIS OF CONSOLIDATED ORGANIZATION REQUIREMENTS

This chapter provides the procedures for consolidating the data collected from the FE organizations into the requirements of a single, consolidated FE organization. Workload, manpower, external support, equipment, charge-out rates, activity civil engineer, and residual engineering office requirements are discussed.

When comparing the consolidated organization with the existing FE organizations, consideration must be given to the differences in the functions and services performed in-house and those performed out-of-house. The CMO data collected for installation support must be added to the cost of the existing FE organizations. This chapter also evaluates which installation support services should be obtained from the host installation and which should be considered for incorporation as in-house functions.

### Consolidated Workload and Manpower Requirements

#### *Staffing Criteria*

The procedure for combining the RPMA workload and manpower data to derive the staffing for the consolidated organization is based on Army manpower regulations contained in DA Pam 570-551, *Staffing Guide for U.S. Army Garrisons*.<sup>20</sup> The Staffing Guide starts at the direct worker level and staffs upward. Application of the Staffing Guide criteria can be accomplished in three phases.

The initial phase of the Staffing Guide application requires integration of the existing FE functions into the consolidated organizational functions.\*

Phase two--determination of the number of direct workers required to support each shop--requires identification of the annual RPMA workload requirements in terms of the accomplished and unaccomplished work. The Staffing Guide does not allow manpower staffing for the operational backlog because an acceptable level of backlog is necessary for planning, ordering materials, and scheduling. The productive manhours per man-year (work order manhours divided by available direct labor manhours) must also be identified. The direct manpower requirements are computed using the following formula:

#### Direct Manpower Requirements

$$= \frac{\text{Accomplished Work} + \text{Unaccomplished Work} - \text{Operating Backlog}}{\text{Productive Manhours per Man-Year}}$$

<sup>20</sup> *Staffing Guide for U.S. Army Garrisons*, DA Pam 570-551, Change 4 (Department of the Army, 24 August 1976).

\* See Chapter 4.

The supervisory requirement for each shop (including shop foremen) is specified in the respective FE yardstick table in the Staffing Guide.

In the final phase of the Staffing Guide application, the administrative levels are determined. FE nonsupervisory and supervisory administrative staff support positions are based on a combination of factors--direct labor force strengths, real property measures, and various document and action counts. The yardstick tables also provide criteria concerning these positions.

The Office of the Chief of Engineers has developed the Automated Staffing Guide Program (ASGP) to determine the manpower requirements for facilities engineering. This computer program can be used to eliminate the complex and time-consuming task of manually calculating the manpower requirements. Appendix B describes this program.

The derived manpower requirements for the consolidated organization should be compared to the existing manpower levels to provide a check on the proposed staffing procedures and an estimate of the manpower savings resulting from consolidation. If an AIFO is being evaluated, the manpower required for the activity civil engineer (ACE) function and the consolidated installation support manpower must be added to the manpower derived for the combined FE organization to determine the total manpower requirement of the consolidated organization.

#### *Assumptions*

Use of the Staffing Guide in this analysis is based on the following assumptions:

1. The on-board staffing level should be used to compare the CMO/consolidated organization manpower requirements to accomplish the same workload. Because the Staffing Guide computations establish the recognized manpower level, a method of establishing the consolidated organization on-board level must be developed. It is assumed for this analysis that the on-board level can be obtained from the Staffing Guide formula if the combined unaccomplished workload is not used, if the overtime included in the accomplished workload is eliminated, and if the operational backlog is removed. Determination of the consolidated staffing levels is discussed in the next section.

2. It is assumed that a minimum of 15 percent of the total shop workload must be estimated using the Engineered Performance Standards (EPS)<sup>21</sup> in order to use the Staffing Guide Formula.

<sup>21</sup>*Engineered Performance Standards*, TB 420-XX (Department of the Army, October 1972).

3. If the Staffing Guide formula is not used because of the lack of applied EPS estimates, it is assumed that a local appraisal established by a manpower survey team will be used. The local appraisal provides the recognized manpower level, but the actual on-board CMO level must be used to establish the consolidated organization on-board level.

4. The consolidated organization manpower will be determined using the Integrated Facilities System (IFS) manpower requirement, which is included in the Staffing Guide. If IFS does not exist in the FE CMO, the IFS manpower determined by applying the Staffing Guide to the FE CMO must be added to the on-board staffing level before a comparison to the consolidated organization can be made. It is further assumed that if the Air Force or Navy FE organizations operate with an automated reporting system, additional manpower need not be added to the CMO for these organizations.

#### *Determination of Consolidated Staffing Levels*

The consolidated staffing levels should be determined for a recognized as well as an on-board manpower requirement. Since the combined CMO on-board manpower accomplished the base year workload using base year funds, the on-board level should be used for comparative analysis with the consolidated organization on-board level. The consolidated staffing procedures for the recognized and on-board staffing levels are defined below. Adjustments to the workload data base and Staffing Guide criteria required to establish the consolidated staffing requirements are also provided.

The contracting capability of the consolidated organization should be identified to reflect the manpower flexibility of the organization. The nonrecurring workload is assumed appropriate for FE out-of-house accomplishment, whereas recurring workload may not be as conducive to contract performance. The utilization of contract labor to accomplish the nonrecurring RPMA workload would allow the consolidated organization to effectively control labor resources and adjust to manpower reductions while monitoring customer satisfaction.

Consolidated Organization Recognized Staffing Level. The consolidated recognized level, called the Consolidated Total Manpower Requirements, is determined by combining the total base year RPMA workload and computing that workload using the Staffing Guide formula. A recognized staffing level must also be calculated for each CMO FE organization based on the base year workload if change 4 of the Staffing Guide was not used to determine the existing recognized manpower requirements. This will insure that proper manpower determinations for a new operating program such as IFS are established. IFS man-year requirements must be established for the CMO if an automated reporting system is not used by the CMO FE organization.

By comparing the revised CMO recognized staffing level to the existing CMO recognized staffing level, the accuracy of the baseline

data can be checked. Any great disparity between the CMO recognized staffing level and the calculated level may be due to incomplete or unidentified base year workload data. Although other conditions may be contributing to the differences, performing this exercise will identify problem areas which should be analyzed.

As previously discussed, it is assumed that in order to apply the Staffing Guide formula, 15 percent of the base year work order activity must be estimated using the EPS. When EPS are not used, the shops' recognized nonsupervisory manpower level must be determined using the current base year local appraisals. The format for presenting CMO local appraisal man-year requirements is given in Figure 20.

Consolidated Organization On-Board Staffing Level. The consolidated organization on-board staffing level, entitled Accomplished Without Backlog and Overtime, is determined by dividing the base year accomplished workload (accomplished minus unaccomplished, operational backlog, and overtime) by the the total productive manhours.

The following workload criteria must be adjusted to develop an consolidated organization on-board manpower requirement comparable to the CMO staffing level definitions in Chapter 3:

1. Adjust Local Appraisals (LA) to CMO On-Board Staffing Levels. The use of LAs where EPS criteria do not exist establishes a recognized staffing level. The consolidated on-board manpower level will be determined by using the actual CMO on-board manpower for the functions estimated using local appraisals.

2. Eliminate Backlog. The unaccomplished workload and operational backlog must be removed from the staffing formula variables to determine the consolidated organization on-board staffing. Since the on-board CMO staffing level did not accomplish any of the identifiable backlog workload, consolidated backlog workload must also be eliminated for proper CMO/consolidated organization manpower comparison. This consolidated organization staffing level is entitled Accomplished Without Backlog.

3. Eliminate Overtime. The base year work order activity accomplished through overtime labor is computed by the staffing formula as straight time. If a shop worked X number of man-years of overtime during the base year period, the Staffing Guide would allow X number of additional positions. Therefore, the consolidated organization would appear to require X number of additional positions. A valid on-board staffing level CMO/consolidated organization comparison requires removal of the overtime staffing credit from the consolidated organization by removing the overtime effort from the base year accomplished workload (without backlog). The man-year difference realized by subtracting the manpower requirements of the Accomplished Without Backlog from the Accomplished Without Backlog and Overtime will establish the man-years of overtime effort.



Hardstick Code	FE Function (Shop #, FE Organization)	Local Appraisal Nonsupervisory	QMAO Nonsupervisory	CMO On-Board Nonsupervisory	Staffing Differences Man-Years	Staffing Differences Est. Cost
		a	b	c	d # (a+b-c)	e

\* Local appraisal nonsupervisory man-years were obtained from Manpower Survey Reports. Local appraisal nonsupervisory and supervisory totals are shown in Figure 7.

\*\* QMAO man-years are included within FE in-house military personnel totals appearing in Figure 8.

\*\*\* On-board nonsupervisors are shown in Figure 8.

\*\*\*\* Man-year staffing difference between current on-board staffing and the local appraisal "recognized level" plus QMAO.

\*\*\*\*\* Estimated cost of the man-year difference was computed by multiplying FE average nonsupervisory salary times the man-year difference of the respective FE function.

Figure 20. Comparison of on-board staffing with local appraisal evaluation.



### *Determination of Contracting Capability*

The staffing level required for the consolidated organization in-house accomplishment of recurring workload must be developed to determine the consolidated organization's maximum contracting capability. The recurring workload factors are computed using the Staffing Guide formula to determine the man-year requirement. Subtracting the recurring man-year requirement from the total recognized gives the man-years of nonrecurring workload. This consolidated organization staffing level is entitled Recurring Without Nonrecurring.

### *Establishing Workload and Manpower Requirements*

The existing RPMA workload requirements are combined and computed using the Staffing Guide formula to determine the total FE in-house manpower requirements. To determine the manpower requirements using the Staffing Guide criteria, the FE functions integrated in Chapter 4 must be categorized as FE shop and FE administrative functions, as shown in Table 3. Staffing both types of functions is discussed in the following sections. The required adjustments to the workload data base are discussed for each function. The FE installation support manpower requirements which may be added to the in-house requirements are discussed in the Installation Support Requirements section.

Table 3

#### Shop and Administrative FE Functions

##### A. Shop FE Functions

##### 1. Buildings and Grounds Division

Carpentry and Masonry

Packing and Crating

Building Preventive Maintenance

Custodial Services

Metalworking

Painting

Pavements Maintenance

Asphalt and Gravel Plant and Quarry Machinery

Railroad Maintenance

Engineer Organizational Maintenance

Table 3 (Cont'd)

Improved Grounds Maintenance  
Unimproved Grounds Maintenance  
Forestry Services  
Fish and Wildlife  
Pest Control

2. Utilities Division

Refrigeration and Air Conditioning  
Boiler Plants  
Heating Systems  
Plumbing and Steam Fitting  
Fuel Storage and Issue  
Exterior Electrical Systems Maintenance  
Water Plants  
Sewage Plants  
Exterior Water Systems Maintenance  
Exterior Sewer Systems Maintenance  
Refuse Collection and Disposal  
Hospital Support

B. Administrative FE Functions\*

Director of Facilities Engineering  
FE Administration  
Engineering Resources Management  
Budget Accounting and Statistics  
Work Reception and Scheduling  
Estimating and Facility Inspection  
Management Engrg. and Systems - IE Ser. and Tech. Asst.

---

\* Items listed are Staffing Guide organizational titles.

Table 3 (Cont'd)

Real Property  
Engineering Plans & Services  
Engineering Services  
Construction Inspection  
Master Plans and Programs  
Supply and Storage Division  
Property Control Branch  
Storage Branch  
Buildings & Grounds Division  
Buildings & Structures Branch  
Roads and Railroads Branch  
Land Management Branch  
Fire Prevention and Protection  
Utilities Division  
Mechanical Branch  
Electrical Branch  
Sanitation Branch  
Hospital Support Branch (OR)  
Hospital Support Division  
Mechanical  
Electrical  
Buildings and Grounds

Staffing FE Shops. The FE shops are staffed through application of the Staffing Guide formula. Each variable of the staffing formula incorporates RPMA workload requirements collected for the base year period. Therefore, RPMA workload documentation is essential to determine accurate recognized manpower requirements within the FE organization. It is also essential that, prior to the consolidation evaluation, estimating procedures were utilized by the FE organizations for at least

15 percent of the base year work order activity. EPS estimated and actual manhours are required to establish an efficiency of the work performed by the shop personnel. Without the efficiency measure, the staffing formula is not applicable.

*Direct Worker Requirement.* The recognized staffing level direct worker requirement for FE shops is determined by one of two staffing criteria: application of the Staffing Guide using the formula computation, or recommended direct worker positions resulting from local appraisals conducted by manpower survey teams.

The Staffing Guide formula is used whenever a minimum of 15 percent of the total shop workload has been estimated using EPS. This is the minimum percentage that allows an efficiency to be calculated. The Staffing Guide utilizes the combined RPMA workload grouped into the staffing formula variables to compute the shop direct worker requirements. The following RPMA workload categories, which have been identified by staffing formula variable descriptors, will facilitate direct worker manpower computations:

1. Total Work Order Manhours Expended. The total direct manhours expended on all work order activity are combined by shop and FE organization. The manhour expenditures in S0, IJ0, and S00 work orders are discussed in Chapter 4. Computing total work order manhours will include:

- a. Totaling the manhours expended by shop to accomplish S0 work orders within the FE and LUCs 12 and 16 in the BCE.

- b. Totaling the manhours expended by shop to accomplish IJ0 work orders within the FE and LUCs 13, 14, 15, and 18 in the BCE.

- c. Totaling the manhours expended by shop to accomplish S00 work orders within the FE and LUCs 11 and 19 in the BCE.

- d. Summing the results of a, b, and c to obtain the total work order requirement by manhours expended in work order activity for the consolidated organization.

Subtracting the nonrecurring manhours from the total manhours (Item d) identifies the recurring manhours. Chapter 4 provides the rationale necessary to identify all nonrecurring manhour expenditures in work order activity.

2. Nonsupervisory Manhours Available. Included in the nonsupervisory manhours are the manhours expended by those persons working in the shops who are not supervisory or clerical personnel. The FE in-house manpower data provide the nonsupervisory man-year effort dedicated to each function of the FE organization; multiplying this figure times 2080, the annual manhour standard, will give the nonsupervisory manhours available. The following adjustments to the nonsupervisory manhour



workload variable are required for particular consolidation staffing levels.

a. For the recurring (without nonrecurring) staffing requirement, the recurring manhours expended in work order activity are divided by the productive manhour factor identified in the total requirements.

b. For the accomplished (without backlog) staffing requirement, the total requirements identified above are used to determine the accomplished (without backlog) nonsupervisory manhours available.

c. For the accomplished (without overtime) staffing requirement, the overtime manhours expended in work order activity are removed from the total nonsupervisory manhours available.

3. EPS Estimated Manhours. Planners and estimators normally apply EPS estimating procedures to nonrecurring work order activity. Occasionally, however, a recurring RPMA workload may be estimated using EPS or other industrial engineer estimating standards; such a determination will have to be made locally. All manhours estimated using EPS are to be collected by shop. The above determination is applicable to all identified consolidated staffing alternatives.

4. EPS Actual Manhours. The actual manhour expenditures charged to work orders that were estimated using EPS are to be collected by shop. This staffing variable is not altered to calculate the various consolidated manpower requirements.

5. Estimated S00 Manhours Remaining Unaccomplished. S00 manhours accomplished during the base year period are subtracted from the estimated S00 manhours to establish the unaccomplished S00 manhours. S00 work order activity is solely recurring work which is predetermined for the entire base year period by shop and FE organization. The estimated unaccomplished manhours are combined to establish the consolidated S00 unaccomplished workload requirement.

6. Manhours Expended on IJOs.\* Manhours expended in IJO activity (including LUCs 13, 14, 15, and 18) should be summed by nonrecurring and recurring manhours accomplished by shop and by FE function. The total IJO manhours expended within the base year period are provided in the data collection format prescribed in Chapter 4. Nonrecurring manhours are then subtracted from the total IJO expended manhours for the base year period to arrive at the recurring manhour expenditure.

7. Manhours Expended on Completed S0s.\* Total manhour expenditures in accomplished S0 work activity (including LUCs 12 and 16) are combined by shop and by FE organization to establish the consolidated

\*Not applicable to the consolidated staffing determinations for the accomplished without backlog and overtime manpower requirements.



requirement. Where SO work order activity is found to include non-recurring and recurring work, the data should be grouped accordingly.

8. Number of Unaccomplished IJOs.\* By definition, unaccomplished IJOs are work orders that were approved for in-house accomplishment during the base year period but were not accomplished during that period. Whatever the reason for noncompletion, the work orders in this classification are treated as base year workload. The total IJO volume that was not accomplished during the base year period is grouped into non-recurring and recurring categories by shop and FE organization. The consolidated requirement is established by combining all unaccomplished IJO work order volume.

9. Number of Unaccomplished SOs.\* The total number of nonrecurring/recurring (where appropriate) SO work orders which were unaccomplished at the end of the base year period is determined by shop and FE organization. Combining the unaccomplished SO volume is necessary to establish the consolidated requirements.

10. Number of IJOs Completed.\* The nonrecurring and recurring IJOs completed during the base year period by shop and FE organization are combined to establish the consolidated workload.

11. Number of SOs Completed.\* The SO work orders for nonrecurring and recurring work, if appropriate, are combined by shop and FE organization to establish the consolidated SO volume for the base year period.

In instances where an acceptable level of EPS is not met, the local appraisal (LA) manpower determinations must be used to establish a recognized staffing level; the most current local appraisal of direct worker requirements is used directly in staffing calculations. The LAs are added at the recognized levels. As an alternative staffing procedure, manpower determinations based on established manpower standards other than EPS are considered acceptable. However, on-board man-years are used in lieu of LAs to establish the consolidated organization accomplished without backlog and overtime staffing levels.

*Direct Shop Foremen.* Supervisory positions are listed in the Staffing Guide yardstick tables. In order to insure that the appropriate supervisory level is determined, the following should be considered:

1. For shops with multiple functions, the staffing yardstick that best corresponds with the majority of the work should be used. For example, if an existing shop identified as "Carpenter Shop" performs the work requirements of two staffing guide FE functions, Carpentry/Masonry

\*Not applicable to the consolidated staffing determinations for the accomplished without backlog and overtime manpower requirements.

and Packing/Crating Sections, with work performed in the Carpentry/Masonry function predominant, this yardstick table is used for the determination of the shop foremen requirements.

2. Supervisory requirements for direct work levels that exceed the yardstick levels are limited to the yardstick maximum, unless modified by a Manpower Survey Team. Working leaders can be utilized as necessary to supplement the supervisory personnel.<sup>22</sup>

*Format.* Figure 21 provides a format designed to facilitate the direct worker formula computations for the various FE organizational structures. The staffing formula variables are arranged by Staffing Guide FE functions for each of the staffing alternatives.

Staffing FE Administrative Support Functions. FE administrative manpower requirements are determined by such variables as the strength of function they oversee, work order activity, real property variables, costs of A/E projects, and property and supply counts. The criterion for staffing determination is identified in the respective Staffing Guide yardstick table. Each table contains the supervisory and non-supervisory manpower requirements of the respective FE administrative function, which is scaled to the appropriate unit of measure. Consolidation of the respective units of measure by function and by FE organization is necessary to determine the consolidated FE administrative support requirements. Figure 22 provides a format for recording pertinent FE administrative manpower criteria by yardstick description and workload factor.

Format for the Consolidated Organization Staffing. The format presented in Figure 23 is designed to provide an overview of Staffing Guide manpower determinations for the existing and proposed FE organizations. Nonsupervisory, supervisory, and total manpower requirements appropriate to each function can be recorded. After this determination, the total manpower requirements of each function can be presented in terms of administrative and direct labor, as shown in Figure 24.

### Consolidated Grade Structure

This section describes assessments to be made to evaluate the possible grade level changes caused by the increased span of control due to consolidation.

#### *Supervisory Grade Levels*

1. The existing FE grade structure should be surveyed and compared to the Staffing Guide position descriptors, which will be used to determine the consolidated position requirement. The position descriptors

<sup>22</sup>*Staffing Guide for U.S. Army Garrisons*, DA Pam 570-551, Change 4 (Department of the Army, 24 August 1976).

Yardstick Code 551-	Function Shop and Number	Total Work Order Manhours Expended (A)	Nonsupv Manhours Available (B)	Efficiency Factors		Est Mhrs Remaining Unaccomp SOOs (F)	Manhours Expended on IJOs (I)	Mhrs ex- pende on Completed SOs (J)	# of Unaccomp IJOs (L)	# of Unaccomp SOs (N)	# of IJOs Compl (O)	# of SOs Compl (P)	Foreman Yard- stick Code	
				Est Mhrs (C)	Act Mhrs Expended (D)									
PART 1 - BUILDINGS AND GROUNDS DIVISION (Code Series 551-630)														
632.21.22														
		Carp & Mas												
		Structural												
		Masonry												
		Total Req												
632.31														
		Recurring (w/o NR)												
		Accomp (w/o Backlog)												
		Accomp (w/o Overtime)												
		Bldg Prevent Maint												
		SMRT												
		Total Req												
632.4														
		Recurring (w/o NR)												
		Accomp (w/o Backlog)												
		Accomp (w/o Overtime)												
		Metal Working												
		Metals												
		Total Req												

Note: Similar entries for other shop functions of Buildings and Grounds Division and Part II, Utilities Division, are to be recorded using this format.

Figure 21. Consolidated RPMA workload requirements for Staffing Guide.

Ydstk. Code	Function	Workload Factor	
		FE Organization	Consolidated
610	FE	Yardstick Description	
		Number of family housing units. Troop population on-post.	
612.1	Ch., Engrs. Resources Mgt. Div.	Annual Work Authorization Documents (Totals of counts below)	
		(1) Service Orders (SOs)	
		(2) Individual Job Orders (IJOs)	
		(3) Job Order Requests (JORs)	
		(4) Standing Operation Orders (SOOs)	
612.3	Work Reception and Scheduling	Annual Work Authorization Documents Number of Individual Job Orders	
612.4	Est. & Fac. Inspection	Annual Manhours spent on IJOs Facility Counts*: (Totals of counts below)	
		Roads	
		Railroads	
		Grounds	
		Parking/Open Storage	
		Walks	
		Airfields	
		Utility Distribution	
		Number of Buildings	
612.5	IE Serv. & Tech. Asst.	Annual Work Authorization Documents (reference 612.1) Authorized Strength of Base Year	
612.6	Real Property	Square feet millions	
613.2	Engrg. Services	Cost of completed-designed in-house projects. Projects Cost Designed by Arch. Engr. for FE. Project Cost Design Incomplete Inflation Factor (Bldg. Cost Index)	
613.3	Construction Insp.	Annual Construction Cost of Completed Projects (millions) Annual Construction with Inspection Serv. Contracted	
613.4	Master Plans & Program	Authorized Installation Strength	
622	Property Control	Monthly Average Line Items	
622	Storage	Monthly Average Line Items	
632.32	Custodial Services	Square Feet of Floor Space Cleaned by Contract	

\* Units of measure converted to facility counts as references in DA Pam 570-551, 612.4

Figure 22. Other data requirements for Staffing Guides.

YOSTM. CODE 551	TOTAL WORKLOAD		CONSOLIDATED WORKLOAD				ACCOMPLISHED W/O BACKLOG AND OVERTIME	
	FE ORGANIZATION		FE ORGANIZATION		RECURRING W/O NONRECURRING		ACCOMPLISHED W/O BACKLOG	
	Nonsupv.	Supvy.	Nonsupv.	Supvy.	Nonsupv.	Supvy.	Nonsupv.	Supvy.

Note. Total all columns at the base of each staffing structure.

Figure 23. Staffing Guide nonsupervisory/supervisory manpower requirements.



YDSTK CODE SSI	FE ORGANIZATIONAL TITLE	TOTAL WORKLOAD			CONSOLIDATED WORKLOAD					
		FE Organization Admn. Staff	Direct Labor	Admn. Staff	Consolidated Admn. Staff	Direct Labor	Recurring W/O Nonrecurring Admn. Staff	Direct Labor	Accomplished W/O Backlog Admn. Staff	Accomplished W/O Backlog & Overtime Admn. Staff

SUBTOTAL

TOTAL

Figure 24. Staffing Guide administrative staff/direct labor manpower requirements.

AD-A041 331

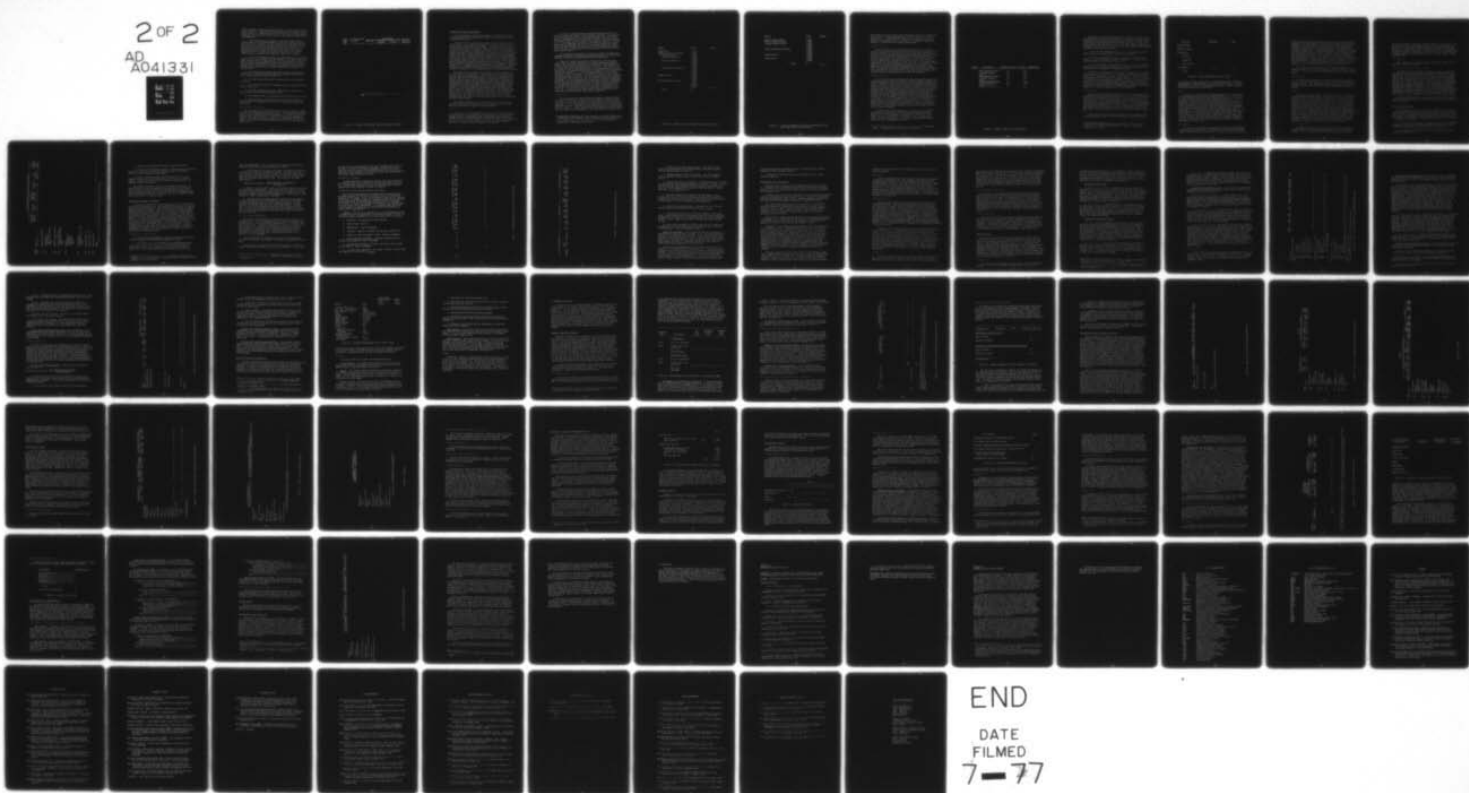
CONSTRUCTION ENGINEERING RESEARCH LAB (ARMY) CHAMPAI--ETC F/G 15/5  
CONSOLIDATION OF RPMA AT FAYETTEVILLE, NC. VOLUME IV. GENERAL P--ETC(U)  
JUN 77 D W BROWN, J L NAY, J G KIRBY  
CERL-TR-C-73-VOL-4

UNCLASSIFIED

NL

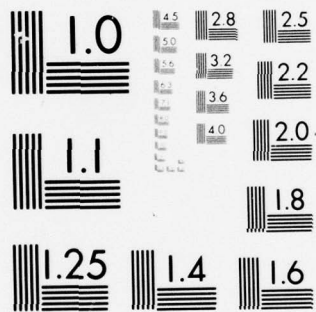
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NATIONAL BUREAU OF STANDARDS-1963-A

within the guide include a position title and a position classification series identifier. Detailed job requirements are not available in the Staffing Guide. A comparison can be made, however, by matching the CMO grades and position classification series to the Staffing Guide description identifiers.

2. Where differences are evident in the CMO position classification series versus the consolidated organization, assessment by the local Army CPO is required. The CPO position classification specialist will be able to analyze the possible grade level changes due to the staffing structure of the consolidated organization. Based on the Staffing Guide and CMO position classification series and a general knowledge of the FE current job standards, the position classifier should be able to evaluate the appropriate grade level increases.

3. After the CPO grade assessment has been completed, the possible grade level and salary changes for the proposed consolidated supervisory grade structure should be presented in the format provided in Figure 25. The data should be presented by yardstick and respective consolidated organization on-board man-years, grade, step, position classification series, total manpower cost, and average manpower cost derived as described below.

a. The proposed consolidated supervisory man-year requirements (on-board) are obtained from the accomplished without backlog and overtime staffing structure shown in Figure 23.

b. The supervisory grade level is determined by the CPO position classifier.

c. The "step-within-grade" is developed using the average CMO step level of Figure 12.

d. Position classification series identifiers are obtained from the respective Staffing Guide yardstick tables.

e. The manpower costs are calculated using base year salary scales.

f. Where applicable, average man-year salaries are computed by dividing the total manpower cost by the total man-years for each yardstick level.

#### *Nonsupervisory Grade Levels*

The increased span of control due to consolidation would not appear to affect the nonsupervisory grade structure. The prevailing Army grade levels and job standards should be applicable to consolidated organization position classifications. A manpower survey can be conducted to evaluate the grades for new positions in the consolidated organization. Figure 13 provides the average nonsupervisory salary for each function within the FE.

Ydstk. Code 551-	FE Organization Function	SUPERVISORY			
		Man-years	Grade/Step & Series	Manpower Total Cost	Manpower Avg. Cost

TOTAL \_\_\_\_\_

Figure 25. Proposed consolidated supervisory grade structure.



### Installation Support Requirements

The requirement for installation support can change drastically after consolidation and conversion of the FE organizations to a consolidated organization.

The first step in analyzing the impact of consolidation on installation support is to identify the amount of support which will be required by the consolidated organization. This volume is rarely the sum of support received by the separate RPMA organizations, due to duplication of the workload, variances in staffing levels and efficiencies of installation agencies, and differences in missions of Army and Air Force support agencies. However, the areas of duplication may not be quantifiable, resulting in the necessity to simply total the CMO requirements. The manning levels, missions, and efficiencies of the lead service support agencies should be used to arrive at the volume of support required by the consolidated organization and the resulting cost. If an AIFO is being evaluated, the AIFO may perform any service completely or partially in-house if it is determined to be beneficial and economical. Services which are not economical to perform in the AIFO can be obtained from commercial sources or on a reimbursable basis from the host installation.

Once the amount of support to be provided and the associated cost of that support is determined, an investigation of each support area must be made to determine which of those areas are to be performed in-house by the AIFO. Any function which is performed in-house must be staffed and evaluated as part of the cost of the AIFO. In-house capability, however, incurs no reimbursable charges to the installation. Determination of whether or not a function is to be performed in-house is based on the cost of the support (external versus internal), and whether an installation agency can provide the function with the responsiveness and flexibility required by the AIFO. This determination must be based on knowledge of services performed by each installation agency and the requirement for each of those services by the AIFO. Although some activities obviously lend themselves more to in-house accomplishment than other, all installation support should be considered for AIFO accomplishment.

Each external support area is listed below with a short discussion of the procedures used to determine the volume and cost of consolidated organizations support to be accomplished.

#### *Comptroller*

The amount of normal comptroller support required by the consolidated organization is approximately the same volume as required by the larger of the FE organizations being consolidated (based on the consolidation of two FE organizations). Certain functions, such as civilian pay, will increase due to a larger work force, but most comptroller functions are highly duplicative between installations.

If an AIFO is being evaluated, additional personnel will be required to accomplish industrial-fund-related activities in the areas of cost accounting and billing. This additional work force can be estimated by knowledgeable FE and comptroller personnel, and by comparison of staffing levels of other industrially funded activities of a similar size. The average grade structure of the existing comptroller section can be used to determine the cost of the required comptroller effort. Figure 26 shows one possible structure for an AIFO comptroller office. This structure is modeled after the structure used for the Navy Public Works Centers (PWC).\*

The PWC should be contacted to develop an estimate of comptroller manpower requirements by comparing the PWC requirements with the size of operation involved in the consolidation effort under study.

Although all comptroller shops perform basically the same functions, there are enough differences in internal procedures between a standard installation comptroller and an industrial fund comptroller to cast some doubt about the compatibility of the two. Additionally, for an industrial fund to operate properly, cost accounting and billing procedures must be implemented which give the organization daily monitoring and control capability. It is questionable whether an installation comptroller office can perform this function in addition to its other installation support missions. If this alternative is to be considered, the additional AIF staffing for the installation comptroller should be calculated. The PWC Systems Branch at the Naval Facilities Engineering Command has identified additional positions which should be considered for an appropriated comptroller office to service an AIFO (Figure 27). If accomplishing comptroller activities in-house is determined to be beneficial, the high cost of security containers, disbursement facilities, etc., may dictate that actual cash and check handling and disbursement be performed by the installation comptroller.

#### *Communications*

The requirements for consolidated organization telephone service will remain essentially the same as those presently existing for the FE organization, with some increase due to the shifting of administrative personnel. This increase should be estimated based on the proportional personnel increase. Equipment must be identified and its cost estimated using AR 105-23.<sup>2,3</sup> Systems which support fire reporting on installations will not change after consolidation. Any activity which remains a part

\*Information was obtained with the assistance of the PWC Systems Branch if the Public Works Division, Naval Facilities Engineering Command.

<sup>2,3</sup> *Administrative Procedures for Communication Services*, AR 105-23 (Department of the Army, 28 July 1975).

<u>Office</u>	<u>Staff</u>	<u>Salary</u>
Comptroller	1-GS14	
General Accounting Division	1-GS12	
General Ledger Br.	1-GS09	
Plant Accounting Br.	1-GS06	
	1-GS05	
Accounts Payable Br.	1-GS08	
	1-GS06	
	1-GS05	
	2-GS04	
Funds Control/Billing Br.	1-GS08	
	1-GS06	
	1-GS05	
	2-GS04	
Budget Division	1-GS12	
	2-GS09	
	1-GS05	
Cost Accounting Division	1-GS12	
	1-GS11	
	5-GS04	
	2-GS03	
TOTAL	28	\$

Figure 26. Example of an in-house AIFO comptroller's office.

<u>Office</u>	<u>Staff</u>	<u>Salary</u>
General Ledger Branch	1-GS09	
Plant Accounting Branch	1-GS05	
Accounts Payable Branch	1-GS06	
	1-GS05	
	2-GS04	
Funds Control/Billing Branch	1-GS06	
	1-GS05	
	2-GS04	
Budget Division	1-GS09	
	1-GS05	
Cost Division	1-GS11	
	<u>5-GS04</u>	
TOTAL	18	\$ _____

Figure 27. Example of additional staffing requirement for the host comptroller to service AIF0.



which remains a part of the residual engineering force will require the same amount of telephone equipment after consolidation (e.g., family housing, etc.). Communications support must be provided externally, whether the telephone system is government or commercially owned, and need not be considered for in-house accomplishment.

#### *Civilian Personnel*

Once the staffing of the consolidated organization is known, an analysis can be done of the staffing (per existing staffing guides such as DA Pam 570-551) for CPO offices at each installation with the host installation CPO servicing the consolidated organization employees. The cost of each alternative is computed by first establishing a base CPO staffing requirement. This base requirement is computed with all civilian RPMA personnel removed from CPO servicing. Then consolidated organization civilian personnel and the civilians in the support offices required to service the consolidated organization are added to the population serviced by the CPO to determine the new staffing requirement. The man-year difference between the base and the new requirement is attributable to the alternative, and the cost is this man-year difference times the average salary for present CPO personnel.

#### *Computer Services*

It is not likely that sufficient workload can be identified for the consolidated organization to justify an in-house computer, because the capital investment in hardware and the cost of operating and maintaining computer systems are high. The consolidated organization can obtain services from the host installation or commercial sources for this service. Although determining the relative cost of each alternative may not be possible until more detailed accounting procedures are effected during implementation, the amount of support required can be estimated by studying the support presently received by each FE organization and relating this to the probable workload of the consolidated organization (Figure 28). The IFS Field Support and Training Branch (DAEN-FEM-F) can provide data on IFS computer usage requirements. The source of support should be selected based on economics as well as a subjective determination of each source's capability to provide the service with the amount of responsiveness necessary for the consolidated organizations to conduct business.

A problem which must be addressed is that the Air Force BEAMS<sup>24</sup> and the Army IFS are similar in many ways and different in others. Although both provide management and operations information to the FE/BCE and status information to customers, as well as meeting external reporting requirements, the exact form and content of reports fulfilling these requirements may differ.

<sup>24</sup>BEAMS: *The Base Engineer Automated Management System*, AFM 85-200, Change 1 (Department of the Air Force, 1 June 1975).



Agency	Description	Machine Run Time	Unit Cost	Annual Cost
	Data Processing Equip	hr.	/hr.	
	Personnel Support	hr.	/hr.	
	<u>Total</u>	<u>hr.</u>	<u>/hr.</u>	
	Data Processing Equip	hr.	/hr.	
	Personnel Support	hr.	/hr.	
	<u>Total</u>	<u>hr.</u>	<u>/hr.</u>	
	Data Processing Equip	hr.	/hr.	
	Personnel Support	hr.	/hr.	
	<u>Total</u>	<u>hr.</u>	<u>/hr.</u>	

Figure 28. Computer support for consolidation.

The problem in consolidating Army/Air Force RPMA activities lies in the continued fulfillment of these information needs. The consolidated organization can support only one of the two information systems. Since it will be an Army organization, the favored system is IFS. The Air Force should accept this fact if IFS and the consolidated organization can continue to meet the Air Force external information needs. Three options for meeting this requirement exist:

1. An automated IFS/BEAMS interface can be developed to provide BEAMS reports, as currently done, to external recipients.
2. Existing IFS reports, similar in content to current BEAMS reports, can be distributed to external recipients. This will require their acceptance of a new report format (IFS).
3. The consolidated organization can provide existing IFS reports to the Air Force residual engineering organization, where they will be reformatted for distribution to external recipients.

Preliminary examination of the two systems\* suggests that contents and procedures are very similar. As a result, a combination of options 1 and 2 would seem to be in order. Where possible, IFS reports should be accepted by the Air Force Major Command (MACOM) as is; in cases where IFS reports are not acceptable to the MACOM or where IFS reports do not exist (four cases), new IFS/BEAMS reports programs should be written. The cost of this new programming effort should be minimal; taking Prime BEEF and PEST routines directly from BEAMS may be possible. The cost to establish IFS should be determined for the consolidation.

#### *Administration*

The inclusion of personnel in the consolidated organization for the management and supply of forms/publications is not a viable alternative, since this would require the initiation of two accounts (one for Army, one for Air Force) for the direct supply of these documents. The required support for the consolidated organization will not change appreciably from that required by the FE organization. It may be assumed that the consolidated organization will have a requirement for publications from other than the lead service, but this support should be minimal. The support should be itemized by activity and cost as shown in Figure 29.

The volume of printing service required can be estimated as that presently received by the FE, since the documents requiring printing

\*Identification and description were accomplished using Figure 1-1, pp 1-10 to 1-17, AFM 85-200 and the BCE's Handbook of Automated Products (circa 1972).

<u>Activity</u>	<u>Man-Years</u>	<u>Cost</u>
Pub/Forms Mgmt		
Pub/Forms Supply		
Reproduction		
In-House		
Commercial		
Copy Service		
Distribution	_____	_____
Total		\$

Figure 29. Consolidated administrative support.

by the BCE are largely duplicative. Distribution and copy service are accomplished in different ways by individual installations. It may be assumed that the mode of accomplishment and amount of support required will be the same as exists for the FE.

#### *Supply*

The amount of supply support required depends on the supply operation concept employed by the consolidated organization. In the case of the consolidated organization, Army procedures should be used, and the majority of supply actions should be accomplished in-house. It is reasonable to assume that the consolidated organization will desire to retain the capability to procure selected items from the host installation supply facilities and that the consolidated support requirement will be approximately the same as that now rendered by the Installation Supply Office. Establishing the consolidated organization supply requirements based on anything but the combined CMO requirements would be very difficult. Combining the CMO requirements for supply will result in an overestimate of supplies due to duplication for shop stock and storage. However, this will provide at least a reasonable estimate of the supply requirements for the consolidated organization, recognizing that a margin of error exists.

#### *Procurement*

The staffing required for procurement activities can be determined from existing staffing guides and validated by extrapolating the present support figures provided to the FE/BCE. The sums of service/construction

contracts and purchase actions both greater than and less than \$10,000 accomplished for the individual FE organizations are used to determine staffing. This method tends to give a slightly higher manning than ultimately required, since some individual actions are duplicative between the installations. The average salary of procurement personnel is used to compute cost. Although the economics of in-house versus out-of-house accomplishment are certainly important, other considerations must be taken into account. One of the most critical capabilities of the consolidated organization in regard to efficient work management is that of being able to procure materials with a high degree of flexibility and responsiveness. An evaluation must be made to determine if a commercial firm or installation procurement could provide the necessary response. This evaluation should include a cost comparison.

If an AIFO is being evaluated, an additional consideration is whether creation of an AIFO will result in a greater number of contracts or IJOs. If so, this must be considered when computing support requirements.

#### *Transportation*

The consolidated organization can either obtain general-purpose vehicles from the installation, lease them from an outside service, or buy them outright. The alternatives should be evaluated, but the final decision should be left to the consolidated organization and higher command.

#### *Movements*

The consolidated requirement for movements support will depend on the procurement operation chosen. If procurement service is to be obtained from the host installation, movements will be handled as they presently are by the Army, and the support required will be approximately the same as presently required by the FE. If procurement services are accomplished in-house (especially if an AIFO is considered), shipments of materials/supplies purchased by the consolidated organization will be delivered directly to consolidated organization warehouse facilities, and all movements functions will be accomplished in-house. Since all shipments are presently handled by FE warehousemen and receiving clerks in addition to the effort expended by movements personnel, an increase in staffing for this activity is unlikely. The movements requirements for the consolidated organization are really procurement functions which may eliminate any manpower specifically dedicated for movements if procurement is performed in-house.

#### *Support Maintenance*

The support maintenance performed by the Material Maintenance Division (MMD) requires a considerable amount of special tools and equipment. It is unlikely that the consolidation organization can



justify the expense of purchasing and maintaining this equipment for the low amount of support maintenance required. An AIFO would, have the option of utilizing MMD or commercial sources for support maintenance. The amount of support required is estimated by applying the proportional increase (from the FE requirement plus the Air Force) in special-purpose equipment in the consolidated organization to the labor effort and cost provided by MMD.

#### *Other Support*

Other support costs for consolidation (materials, supplies, etc.) should be estimated as required.

#### *Consolidated Installation Support Summary*

To summarize the consolidated installation support requirements, the total man-years and personnel costs should be determined for each alternative, i.e., in-house, host installation, and commercial agencies. The man-years retained by the installation support agencies should be added to the man-years identified for each alternative. The retained man-years are included because this is part of the cost to consolidate the functions. Figure 30 provides a sample format which can be used to present these manpower requirements. This presentation includes the man-years and personnel costs for the functions performed in-house to complement the functions performed by the installation support agencies. Since these manpower requirements are added to the installation support requirements to identify total functional requirements, the in-house functions must not be included in the in-house manpower consolidation.

The consolidated other cost associated with each function should be identified for each installation support agency and the costs totaled for all functions.

#### Activity Civil Engineer

Establishment of Activity Civil Engineers (ACE) will be necessary in most consolidation actions using an AIF. An ACE will act as an in-house customer representative for each installation involved in consolidation and will coordinate the work requests for the installation and its tenant customers, such as nonappropriated activities. The functions of the ACE are as follows:

1. Develops and coordinates a comprehensive facilities management program providing close relationship between the AIFO, the residual engineering organization, and nonappropriated activities.
2. Evaluates the effectiveness of the AIFO support to service activities identified in 1.



Consolidated with Army Providing Support							
Ydstk Code	Function	Man-Years Required by Army	Personnel Cost b	Man-Years Retained by Air Force c	Personnel Cost d	Total Man-Years e(a+c)	Total Personnel Cost f(b+d)
60	MISO/Data Automation						
100	Comptroller Installation AIF (If applicable) TOTAL						
220	AG/Base Administration						
270	Civilian Personnel Installation Support TOTAL						
520	Supply Installation FE/Supply BCE/Supply TOTAL						
530	Procurement Trans/Movmts Br (562) TOTAL						
560	Transportation Div						
570	Material Maint Div						
700	Communications						
	TOTAL						

Figure 30. Consolidated installation support manpower requirements.

3. Provides liaison between the AIFO and customer commands.
4. Provides technical advice relating to AIFO functions and services and assists activities in detailed planning for their maintenance, utilities, and transportation requirements.
5. Assists in preparing plans and specifications for various command projects and reviews the adequacy of such plans and specifications. Inspects and coordinates all contracts administered by the AIFO for serviced activities.

The manpower required for the ACE will depend on the number of installations involved, the number of nonappropriated activities, and other customers. At least one ACE will be required for each installation. The number of ACEs per installation should be documented in man-years required and total cost. The grade level for the analysis should be a civilian GS/11 or military 03/04.

#### Consolidated Equipment Requirement

It should be assumed that the CMO equipment will be transferred to the consolidated organization. The equipment inventory data for each FE organization should serve as a basis from which to determine the consolidated equipment requirements. Any excess existing in the CMO inventory should be removed to avoid counting it as excess due to consolidation. The difference between the current level of equipment and the consolidated organization requirements is the excess created because of consolidation. The current value of this excess equipment can be viewed as a potential cost avoidance because the government often cannot recover the full current value of used equipment. The equipment can always be excessed to another government activity (a cost avoidance) or sold at salvage, which is lower than actual value (not desirable). However, consideration should be given to selling excess equipment for which the government could obtain the current value, e.g., trucks, autos, etc., resulting in an equipment savings.

#### *Determination of Current Value*

This section presents suggested methods for evaluating the current value of equipment by establishing the depreciation value.

1. The current value of SP vehicles can be determined using the *Construction Equipment Cost Guide*.<sup>25</sup> The guide provides tables for various SP equipment and a methodology for estimating the current resale value. Use of the guide requires the acquisition date, cost,

<sup>25</sup>E. Neely, *Construction Equipment Cost Guide*, Technical Report P-52/ADA016788 (U.S. Army Construction Engineering Research Laboratory [CERL], November 1975), pp 27 and 30.

make, and model number. The cost guide is available from the National Technical Information Service, Springfield, VA 22151.

2. The GP vehicles, SP trucks, and light off-highway equipment can be depreciated using the straight-line method.<sup>26</sup> The acquisition cost and a 10-year estimated life must be used. It should be assumed that GP vehicles do not depreciate to zero, but retain a constant salvage value equal to one-tenth of the initial value. The formula to calculate depreciation is

$$\text{Depreciation Cost/Year} = \frac{\text{Acquisition Cost} - \text{Salvage Cost}}{\text{Estimated Life}}$$

3. Table 1-2 of AR 415-35<sup>27</sup> gives an alternative method of evaluating SP and GP vehicle depreciation. The hourly use ratio table of this AR can only be used if the total operating hours are available; this is the only way of knowing exactly the total depreciation. Approximations could be made if 1 year's utilization is available.

4. Shop and office equipment depreciation should be determined by straight-line depreciation. A useful life of 10 years and a salvage value of one-tenth of acquisition cost should be assumed. The only exception to the above are tool kits, which should have an estimated life of 5 years and a salvage value of one-fifth of acquisition cost. The current age of shop and office equipment will probably not be available. A reasonable assumption is that the current value is one-half of the acquisition cost.

#### *Estimation of O&M Expenditures*

Maintenance and operations cost records are only maintained on an aggregate level. The only accepted source for estimating operation and maintenance costs on an equipment-by-equipment basis is the hourly rate table of AR 415-35. Since utilization records are only available for SP and GP vehicles, actual O&M cost can only be estimated for vehicles. The procedure is to determine the appropriate depreciation rate corresponding to the acquisition cost. The annual utilization (hours) multiplied by the rate equals the estimated annual O&M cost for a particular piece of equipment.

Since no O&M costs are available for shop and office equipment, they must be estimated. One method is by taking a percentage of initial cost.

Consolidation of equipment may not require evaluation of O&M cost, because O&M expenses should be a function of utilization. Thus, as long

<sup>26</sup> *Asset Depreciation Range System* (Department of the Treasury, 1971).

<sup>27</sup> *Construction: Minor Construction*, AR 415-35 (Department of the Army, 16 July 1970).

as the amount of work performed is the same, the O&M expenses will be the same. The smaller consolidated equipment inventory will have a lower depreciation expense than the CMO inventory; the value of the difference in the inventory is recoverable at the time of consolidation, and no other downstream benefits occur.

#### *Presentation of Results*

The O&M expenditures, depreciation values, and current values for each equipment type can be recorded in the format presented in Figure 18. The equipment volume and cost for each equipment type should be summarized by shop (function) as shown in Figure 31.

#### *Determination of Consolidated Equipment Requirement*

The consolidated equipment requirement should be constructed by equipment category (SP, GP, shop, and office) for each consolidated organization FE element. Since the consolidated organization's workload is the same as the CMO workload, the equipment required for the consolidated organization can be determined through analysis of equipment utilization. By maximizing equipment utilization, excess equipment due to consolidation can be determined. It is important that any current excess equipment be identified and removed before establishing the excess due to consolidation.

Vehicles. The GP and SP equipment excess can be determined by the following procedure and documented in the format presented in Figure 32. The letters below correspond to the column letters used in the format.

- a. Yardstick: the yardstick for each function.
- b. Vehicle Type: GP or SP.
- c. Nomenclature: name of equipment.
- d. Location: identify a separate line for each installation.
- e. Number of Items of Equipment in CMO: volume of equipment.
- f. CMO Average Hours Available: the total available hours is divided by the number of items of equipment.
- g. Average Hours Utilized: the total utilization hours divided by the number of items of equipment.
- h. Current Excess Equipment: the volume of number of items times the proportion of excess hours  $[e(\frac{f-g}{f})]$ .

Yds. tk. Cost	GP Vehicles				SP Vehicles				Shop Equipment			Office Equip		Totals	
	# of GP Veh.	Acq. Costs	O&M Costs	Curr. Value	# of SP Veh.	Acq. Costs	O&M Costs	Curr. Value	Shop 1,000+	Shop 1,000-	Ofce. Furn.	Ofce. Mach.	Acq. Costs	O&M Costs	Curr. Value
Shop															

TOTAL

Figure 31. Equipment summary by shop for each installation.



Description/Location		Current Excess				Excess Due to Consolidation			
Yardstick	a								
Vehicle (6P/Sp)	b								
	Type								
	Nomenclature	c							
	Location	d							
	# Items of Equip.	e							
	Avg. Hours Avail.	f							
	Avg. Hours Util.	g							
	Excess Equip.	h							
	Current Value of Exc. Equip.	i							
	# Items of Equip.	j							
	Avg. Hours Avail.	k							
	Avg. Hours Util.	l							
	Excess Equip.	m							
	Current Value of Excess Equipment	n							

Figure 32. Determination of excess vehicle value.

i. Current Value of CMO Excess Equipment: the lowest current value or utilization from the equipment entry for the same yardstick from the equipment data in Figure 18.

j. Combined Number of Items of Equipment: the total number of items of equipment in CMO minus the total current excess equipment  $[\Sigma e - \Sigma h]$ .

k. Combined Average Hours Available: the CMO average hours available are multiplied by the difference between the CMO number of items of equipment and the CMO excess equipment for each location; the products for each location are summed and divided by the combined number of items of equipment  $\left[ \frac{f_1(e_1 - h_1) + f_2(e_2 - h_2)}{j} \right]$ .

l. Combined Average Hours Utilized: The CMO number of items of equipment is multiplied by the CMO average hours utilized for each location; the products for each location are assumed and divided by the combined number of items of equipment  $\left[ \frac{(e_1)(g_1) + (e_2)(g_2)}{j} \right]$ .

m. Consolidated Excess Equipment: the number of items of equipment multiplied by the proportion of excess hours  $\left[ j \left( \frac{k-1}{k} \right) \right]$ .

n. Consolidated Current Value of Excess Equipment: the current value is estimated by selecting the lowest value from the corresponding equipment data in Figure 18. The value selected for column i should not be used; the next lowest current value or utilization should be used instead.

The consolidated organization vehicles required can be determined by subtracting the consolidated excess equipment (column m) from the combined number of items of equipment (column j).

Shop/Office Equipment. Since utilization data are very sparse or nonexistent for shop and office equipment, a more subjective approach is required. Two approaches should be used. First, interviews with shop and administrative personnel may reveal if additional equipment requirements will be necessary given the combined CMO workload. Combining the CMO equipment may result in unnecessary duplication, especially for highly specialized equipment with low utilization.

Second, an office-equipment-cost-to personnel ratio can be calculated for the preconsolidation FE organizations by dividing the total equipment cost for each organization by the number of CMO administrative personnel. Each FE organization average should be calculated separately to insure that they are all representative. If any FE organization average appears to be unrepresentative, it should not be used in computing the total average. The total average can be multiplied by the

consolidated organization manpower savings for administrative staff to produce the office equipment savings.

The shop/office equipment should be considered to have a current value of 50 percent.

#### Consolidated Space Requirements

The objective in locating the consolidated organization facilities is to provide usable and adequate facilities while minimizing the number of facilities, thus reducing consolidated organization building operation and maintenance costs.

In determining the facilities required for the consolidated organization two basic considerations should be kept in mind. The facilities decided upon must be adequate for each activity, and the location must lend itself to the efficient accomplishment of the work to be performed there.

The relationship between shops must be considered. For efficient operation, shops which interface with each other on a frequent basis, such as Carpentry, Plumbing, Interior Electric, and Painting, should be located in the same area. Shops which work virtually alone, such as Entomology, can be separated, but supervisory control by branch and division chiefs will suffer.

Collocating all administrative functions to insure efficient operation is desirable. It is imperative that the Utilities, Buildings and Grounds, and Engineer Resources Divisions and the warehouse of the Supply and Storage Division be located close to the majority of shops.

In general, the FE and BCE occupy complexes of facilities consisting of administrative, shop, storage buildings, open storage, and parking areas. The options to be considered in identifying the facilities for the consolidated organization include the use of all or part of these existing engineer compounds, construction of new facilities, and relocation of the consolidated organization to other existing facilities on the installation. The construction of new facilities is prohibitively expensive and will be immediately rejected as an alternative unless there are mitigating circumstances such as an approved project and appropriation for construction or totally inadequate facilities available. Finding suitable unoccupied facilities elsewhere on an installation is unlikely, but this possibility should be investigated before it is rejected.

The usual approach is to use either the FE or BCE compound as the "base" compound and to include all, or as many as possible, consolidated organization functions in this area. Selection of the base compound should be based on the buildings' type of construction; the facilities' capacity to absorb increases due to consolidation and future expansion;

and location and suitability of the structures and open areas for the purposes proposed.

#### *Shop Space*

It may be found that most shops can absorb personnel and equipment increases of a sufficient size to accommodate consolidation with no changes required because most work accomplished by shop personnel occurs in installation facilities. Shop space is only required for shop work, which is not likely to increase significantly after consolidation. Facilities in the vacated engineer compound are available for use for those shops which require additional space because of consolidation or because they do not presently have sufficient space. Consideration must be given to the function of the shop and the suitability of the vacated quarters for that function.

#### *Administrative Space*

The second, and usually most critical area to be considered, is administrative space. Administrative personnel normally do not have sufficient space, and any increase in personnel due to consolidation will compound the problem. One alternative is to relocate portions of the administrative effort to the vacated facilities, but this can have a severe adverse impact on mission accomplishment. Other alternatives include constructing additional facilities at the base compound, converting additional facilities at the base compound, or converting existing structures to office space, if movement of the activity to these buildings would have a less damaging impact on consolidated organization operations. The alternative chosen should be based on economic considerations as well as the desirability of retaining all administrative functions at the base location.

In determining the amount of additional space required for administrative functions, it is unreasonable to expect that additional personnel will be allowed the amount of space specified under current design criteria unless the present lead service FE administrative staff has sufficient space available to accommodate them in this way. Installations do not normally have the space available to accomplish this. To approximate the space required, the amount of floor space now allocated to administrative personnel should be computed, and this figure applied to the increase in personnel. This method, which will insure that the consolidated organization will not be more crowded than the present organization, is more realistic in view of current budgetary constraints.

#### *Storage Space*

Only major structures need to be considered; identifying each small shed or building and its disposition after consolidation is neither necessary nor desirable. The major storage areas in the base compound



must be surveyed to determine the sufficiency of the space for consolidated organization storage requirements. The consolidated storage requirement will not be greatly in excess of the present larger engineering organization's storage, since many of the line items carried will be duplicated between the present organizations. Fast-moving shop stock items must be stored close to the majority of shops. Although providing all covered storage at the base compound is desirable, larger and slow-moving items can be stored at other locations without severely affecting the supply function.

#### *Open Storage and Parking Areas*

The amount of open storage and parking areas presently available, both for privately owned and government-owned vehicles and equipment, should be determined to obtain an approximation of the final amount of space required in these areas. If sufficient area is not available at the base compound, a survey of the property surrounding that compound should be made to determine whether expansion is possible. Open storage and equipment parking areas are easily expanded at very little cost if sufficient space is readily available. Parking for private automobiles and shop vehicles must be located near the shops, where the majority of people work.

#### *Residual Staff Space*

Once facilities for the consolidated organization have been decided upon, facilities required for the residual engineering staff at each installation can be considered. The facilities will be administrative in nature. Locating them in quarters vacated due to consolidation may be possible. Consideration should also be given to the location of the residual staff in relation to the installation it represents, since its first responsibility must be to the commander of that installation.

#### Charge-Out Rates

The charge-out rates must be established to ensure that each FE organization is tested fairly. Under an industrial concept, the AIFO must be reimbursed by its customers for the full cost of services necessary to support the RPMA work order activity, i.e., the productive element. To effectively recover overhead costs and anticipated expenses, the AIFO expenses must be evaluated continually. If this process is adequately followed, the industrial fund will be able to maintain a zero profit and loss position. Relationships between FE support elements and FE productive elements are defined below to permit calculation of overhead rates and distribution of overhead costs to the productive elements (i.e., direct labor and utility service).

#### *Overhead Rate*

Two categories of FE support are analyzed for overhead rate determination: (1) FE administrative overhead expense (for AIFO) from



in-house/out-of-house functions (i.e., Comptroller., Supply, CPO, MISO), and (2) FE direct overhead expense from Engineering, Plans and Services Division, Buildings and Grounds Division, and Utilities Division (including branch administration, office supplies and services, etc.). The overhead rate development techniques and estimating criteria utilized to determine a fair share of overhead are defined below.

#### Overhead Rate Development

*FE Administrative Overhead.* An AIFO will be able to charge for administrative overhead. A single predetermined overhead rate is developed for all FE administrative functions so that the total administrative expense, which is not identifiable to a specific job, can be distributed to all direct labor hours performed. Thus, the total estimated direct labor hours expended in performing customer work order activity during the base year period is divided into total estimated FE administrative expense to be incurred during the fiscal year.

*FE Direct Overhead.* A predetermined rate is developed for each division and its respective branch functions to distribute all expenses not identifiable to a specific job to all direct labor hours performed by the division in work order activity from the base year period. The estimated FE direct overhead expenses are divided into the respective direct labor work order manhours to determine the FE direct overhead rate for the respective FE shops.

#### Overhead Rate Estimating Criteria

*Basic Pay.* The total manpower cost requirement of the FE support element is calculated and recorded without the cost of fringe benefits. The consolidated grade increase manpower cost identified in Figures 12 and 25 provide the basic pay of FE in-house support elements. The fringe benefits must be removed from these cost computations for basic pay determination. The minimum consolidated installation support personnel cost of each support element recorded as shown in Figure 30 is used to determine the basic pay of FE out-of-house support elements. Consolidated FE out-of-house manpower cost computations are pre-established and do not include fringe benefits.

*Fringe and Leave.* Fringe and leave percentages are multiplied by the basic pay determinations defined above to establish their cost. Employee fringe benefits are determined using 28.7 percent of basic pay, as established in an Office of the Secretary of Defense memo dated 27 August 1976.<sup>28</sup> Employee leave costs are calculated at 20.9 percent of basic pay, using AR 235-5<sup>29</sup> guidance.

<sup>28</sup>Memorandum, Office of the Secretary of Defense, Subject: Revised Rate Structure for DOD Instruction 4100.33 (27 August 1976).

<sup>29</sup>*Industrial Activities and Labor Relations Management of Resources; Commercial and Industrial-Type Functions*, AR 235-5, C3 (Department of the Army, 6 November 1974).

*Other Costs.* FE administrative office personnel will provide the actual base year cost data of other expenses (travel, training, etc.) incurred by the FE support elements. The total other costs are divided into the respective basic pay manpower costs to calculate an average percentage of other costs to basic pay. The average other cost percentage is then multiplied by each support element's basic pay manpower cost to construct this cost factor.

*Overhead Rate Presentation Format.* The overhead rate computations prepared for each FE administrative and direct support element are presented below and shown in Figure 33.

*FE Administrative Overhead Rate.* A single overhead rate is computed for the total FE administrative support element. Total costs are divided into the total productive consolidated manhours identified below to determine the appropriate hourly overhead rate for FE administrative support. This rate is then distributed equally to each of the FE direct overhead support elements listed below the FE Administrative Staff heading in Figure 33.

*FE Direct Overhead Rates.* FE direct overhead rates are computed for each of the FE direct support elements; e.g., Engineering, Plans and Services Division, Buildings and Grounds Division, and Utilities Division. Included within the independent division rates are the expense elements of their related branch functions. Total costs of each division are divided into their respective productive manhours to determine the FE direct overhead rate for each division.

*FE Support Overhead Rates.* The total FE support expense (administrative and direct) is not fully recoverable until the FE administrative overhead expense is added to the direct overhead expense. Thus, the FE direct overhead rate and the FE administrative rate are added to determine the total FE support overhead rate of each division. The total overhead can then be appropriately distributed to each division's respective FE productive elements. For example, FE support overhead rate computations (administrative plus direct overhead) for the Buildings and Grounds Division can now be costed to the FE shops direct labor rate. The same direct labor rate applies to all FE shops within a designated division. The following section describes this procedure in greater detail.

#### *Direct Labor Rate*

A direct labor rate including overhead is predetermined for all FE shops by dividing the productive manhours by the sum of all FE productive (FE shops) and FE support (FE administrative and direct overhead) expenses. Detailed direct labor rate determination procedures are identified below.

Yardstick Code	Manpower Cost	Fringe & Leave	Other Costs	Total Costs	Productive Manhours	Direct Labor Rate	Overhead Rate/HR Administrative	Total
<b>FE Administrative Staff: (In-House)</b>								
570-551:								
100	Comptroller*							
530	Procurement*							
560	Transportation*							
610	FE							
611	Administration							
612.1	Ch., Engr. Res. Mgmt.							
612.3	Work Recept. & Sch.							
612.4	Est. & Fav. Insp.							
612.5	IR Mgmt. Serv. & Tech. Asst.							
612.6	Assets Acctg.							
613.1-4	Engrg. Plans & Services							
621	Ch. Supply & Strg. Div.							
622	Property Control							
623	Storage							
	SUBTOTAL							
<b>FE Administrative Support: (Out-of-House) *</b>								
60	MISO/Data Automation							
220	AG/Base Administration							
270	Civilian Personnel Div.							
520	Supply Div.							
570	Maintenance Div.							
700	Communications-Electronics							
	SUBTOTAL							
	TOTAL FE ADMINISTRATIVE OVERHEAD							
<b>FE Direct Overhead: (In-House)</b>								
613.1-4	Engrg. Plans & Services							
631	Bldgs. & Grds. Div.							
632.1-32	Bldgs. & Struct. Br.							
633.1	Roads & RR Br.							
634.1	Land Mgt. Br.							
651	Utilities Div.							
652.1	Mechanical Br.							
653.1	Electrical Br.							
654.1	Sanitation Br.							
	TOTAL FE DIRECT LABOR OVERHEAD							
<b>GRAND TOTAL: (Administrative/Direct Labor Overhead)</b>								

\*These support elements should be considered as in-house and out-of-house alternatives.

Figure 33. Sample format of estimated consolidated overhead rates.

Direct Labor Rate Development. The direct labor rate is developed from estimates of the productive manhours available to perform customer work order activity, the total shop manpower expense, and the total FE overhead expense.

*Productive Manhours.* The man-year totals of each FE shop identified in the Accomplished Without Backlog and Overtime column of Figure 23 are used to construct the productive manhours available to perform customer work order activity. The total man-years are then computed using a 1 to 10 supervisor-to-direct-worker ratio. This computation is based on the assumption that large shops would utilize working leaders (1 for each 10 direct workers). Since the Staffing Guide does not provide secondary supervisory requirements within yardstick table definitions, the local Army CPO should ascertain whether this supervisory-to-direct-worker ratio is appropriate to the survey study site. Productive man-years are constructed based on the number of direct workers derived from the supervisory-to-direct-worker ratio computation. The constructed productive man-years are then multiplied by a productive annual manhour factor such as 1750 (PWC estimate) to determine the total productive manhours.

*Total Shop Manpower Expense.* The total FE shop salary is constructed using the consolidated proposed average supervisory and nonsupervisory salaries. Nonsupervisory average salaries are obtained from Figure 13 using FE cost factors (omitting the fringe benefits) for related shop functions. Supervisory average salaries are obtained from Figure 25 using CPO grade and salary increases. The total shop salary cost is obtained by multiplying these averages by the man-year total for the shop identified in the previous step. The total shop salary cost is then adjusted to include the cost of fringe and leave benefits using the base year fringe and leave (to include compensation) percentages.

*Total Overhead Expense.* The total overhead expense identified in Figure 33 by each FE direct overhead division is then computed and added to the shop salary cost to predetermine the consolidated organization direct labor rate of each shop.

Direct Labor Rate Estimating Criteria. The consolidated organization direct labor rate of each shop is calculated and categorized into the following cost elements.

*Hourly Basic Pay.* The hourly basic pay is calculated by dividing the total shop salaries by the available productive manhours.

*Fringe and Leave Hourly Rate.* Fringe and leave percentages are multiplied by the FE shop hourly basic pay to determine the appropriate hourly rate of this cost element.

*Total Basic Pay.* Total basic pay is the sum of the hourly basic pay plus fringe and leave.



*Overtime.* The overtime rate is determined by multiplying 1.5 times the basic pay, and adding the fringe and leave hourly rate to this cost element.

*Overhead.* Overhead rates, which include the FE administrative overhead, are computed for each FE direct overhead division (i.e., Engineering, Plans and Services, Buildings and Grounds, and Utilities). This rate should appear in Figure 33. The appropriate division rate is then applied to the respective shop functions.

*Total Basic Pay With Overhead.* The rate is calculated by adding the overhead rate to the total basic pay.

*Total Overtime With Overhead.* The overtime with overhead rate is calculated by adding the overtime rate to the overhead hourly rate. Although overtime is computed at 1.5 times the hourly basic pay, all other costs within this category are calculated using 1-hour cost factors.

Direct Labor Rate Presentation Format. The predetermined consolidated organization direct labor rate computations for each shop can be presented in the format shown in Figure 34. It should be noted that the Fire Department is not included in any of the cost computations appearing in this format.

#### *Utility Service Rates*

The utility service rates are predetermined for each anticipated utility service requirement of the consolidated organization. Army rate determination procedures for the sale of utilities are to be used as the estimating criteria. However, the support overhead expense must be treated as an additional cost factor when operation and maintenance services are applicable to a specific utility. The rate computations for the sale of utilities are then adjusted to include the full cost of consolidated organization services. Utility service rate development, utility service rate estimating criteria, and presentation format details are provided below.

Utility Service Rate Development. The formula for determining utility rates is:

$$\text{Utility Unit Cost Rate} = \frac{\text{Total Utility Service Expense}}{\text{Total Consumption}} .$$

To complete the formula, all utility expenses and utility consumption rates for the consolidated organization must be predetermined using base year statistics. Utility rate calculations must include the following components:

1. Cost of utility (as billed and paid for by the government).



	Man-years a	Manhours b	Salaries c	Hourly Basic Pay d(c÷b)	Hourly Rate Without Overhead			Hourly Rate With Overhead		
					Fringe & Leave e	Total Basic Pay f(d+e)	Overtime g(dx1.5+e)	Overhead h	Total Basic Pay i(f+h)	Total Overtime j(g+h)

Yardstick  
Code  
570-551- FE Function  
FE Engineering Plans & Services.

FE Buildings & Grounds Division:

Buildings & Grds. SUBTOTAL

FE Utilities Division:

Utilities SUBTOTAL

GRAND TOTAL:

Figure 34. Direct labor rate (with and without applied overhead).

2. Actual operating and maintenance cost, plus FE support overhead (Figure 33) for the appropriate portion of the utility system.

3. System loss. The respective CMO FE Utility Division personnel who monitor the utility program can provide the appropriate percentage of utility system losses.

4. Capital charges. The capital charge component includes a percentage of the cost of money (interest) to construct the system, plus a cost for amortization of the utility system. The Army regulations identified in the next section provide guidance for determining an appropriate capital charge percentage.

5. Fuel adjustment cost. The electrical utility billings from the surveyed area are used to determine the fuel adjustment cost for electric service rate computations.

Utility Service Rate Estimating Criteria. Utility service rate determinations are calculated using the established Army estimating criteria contained in AR 420-41,<sup>30</sup> AR 420-80,<sup>31</sup> TB Eng 54,<sup>32</sup> FORSCOM Regulation No. 420-23,<sup>33</sup> and the AFEN-FEU, HQ, FORSCOM letter of 29 August 1974, Subject: Supplementary Rate Calculations for Sale of Electricity.

Utility Service Rate Presentation Format. The estimated consolidated organization utility service rates can be presented in the format shown in Figure 35, which shows a utility rate for each anticipated utility service requirement of the consolidated organization. This format also provides a comparative overview of CMO utility rates (without overhead) versus consolidated organization predetermined utility rates (with overhead).

#### Residual Engineering Organization

A Residual Engineering Organization (REO) should be considered at each installation involved in the consolidation to provide the installation commanders with their own engineering staffs for planning and coordinating RPMA. The REO will be responsible to the respective installation commanders for preparing annual work plans, establishing RPMA priorities, maintaining installation real property and master planning records, and

<sup>30</sup>*Utilities Contracts*, AR 420-41 (Department of the Army, 8 July 1969).

<sup>31</sup>*Sales and Furnishing of Electrical Services*, AR 420-80 (Department of the Army, 28 March 1967).

<sup>32</sup>*Repairs and Utilities: Utilities Contracts*, TB Eng 54 (Department of the Army, 14 September 1959).

<sup>33</sup>*Facilities Engineering Preparation of Annual Cost Analysis and Rate Determinations*, FORSCOM Regulation No. 420-23 (Department of the Army, 16 October 1973).

<u>Service</u>	<u>Unit</u>	Consolidated Organization Unit <u>\$ Cost</u>	CMO/FE Unit <u>\$ Cost</u>
Electric (Main Post)	kWh		
Gas, Nat.,-Interruptible	therms		
Gas, Natural - Firm	therms		
Water	gal (millions)		
Sewage	gal (millions)		
Space Cooling	sq ft/mo		
Space Heating	sq ft/mo		
Refuse C&D	cu yd		
Refuse Disposal	cu yd		
Fuel Oil #2	gal		
LP Gas	gal		
Coal, Lump			
-Ready for Delivery	ton		
Delivered	ton		
Emergency Overtime	per hr		
Telephone Rate			
-Preparation for Install	ea		
Pest Control	per hr		

Figure 35. Estimated consolidated utility service rates.

coordinating and monitoring the activities of the consolidated organization for the installation. The technical part of the work, however, will be provided on a reimbursable basis by the consolidated organization.

#### *Functions*

The proposed REO will encompass the following functions:

Liaison Officer. The Liaison Officer directs the activity of the REO for the installation commander by establishing and monitoring the RPMA performed by the consolidated organization.

Budget. This function consists primarily of collecting, analyzing, and presenting statistical operating data for budget and control purposes. The REO Budget Office will prepare and monitor the installation budget for the consolidated organization, and approval for funds will be made based on the REO budget.

Master Planning. This function consists of development and coordination of the installation facilities master plan; assistance will be provided, on request, by the consolidated organization Engineering Plans and Services Division. The REO Master Planning and Real Property Office will be responsible for the following activities:

1. Developing the installation master plan
2. Developing the construction and demolition program, including justification and supporting data
3. Organizing appropriate installation planning boards to determine master plan and installation priority of projects
4. Developing detailed master planning documents
5. Coordinating the master plan and construction program with appropriate staff sections at the installation and in the consolidated organization
6. Serving as installation engineer representative concerning future mobilization planning.

Real Property. This function consists of maintaining installation real property records based on data supplied by the consolidated organization. It will be consolidated with master planning in the Master Planning and Real Property Office.

Family Housing. Family housing may be placed in the Air Force REO because it usually resides within the BCE; however, this function is not evaluated with respect to staffing or costs. Instead, the current staffing will be maintained. It is assumed that the Air Force REO Family Housing Office will perform the same activities the BCE currently does. The FE does not normally perform the family housing function, and the Army REO should not assume this responsibility.

#### *Staffing*

The REO will require a secretary and at least one position for each of the first four functions identified (more may be required depending on the size of the installation). The Air Force may have additional family housing requirements. The liaison officer should at least be a 05 military or civilian equivalent. The other grade levels can be established by using existing positions for guidance. The REO personnel requirements, including the grade levels and personnel cost, should be documented.

## 6 COMPARATIVE ANALYSIS

The feasibility of consolidating RPMA is examined by comparing the combined CMO cost for the base year period (Chapter 4) with the estimated cost of a consolidated organization performing the same workload (Chapter 5). The cost analysis compares costs of manpower needed to perform the required RPMA and to provide installation support, equipment costs, and other related costs. The workload requirements and the supply/material costs are assumed to be the same for the combined CMO and consolidated organization for the base year period. The estimated savings due to consolidation should be compared to the estimated cost of RPMA implementation. The comparative analysis is completed by preparing an environmental impact assessment (EIA) to determine the effects of changing from the CMO to the consolidated organization on the local economy.

### Manpower Comparative Analysis

Manpower and related cost requirements of the consolidated organization in-house functions\* are analyzed by comparing the combined base year CMO to the consolidated requirements. The FE in-house staffing levels of the CMO are compared to the calculated consolidated staffing levels using comparable Staffing Guide criteria. The Staffing Guide is used to determine the consolidated organization recognized manpower requirement from the combined workload in the base year; however, by adjusting the Staffing Guide criteria to establish just the accomplished workload manpower requirement, the consolidated on-board staffing level can be estimated. The CMO and consolidated organization on-board manpower levels can then be compared. The manpower cost comparison is made by using the base year average supervisory and nonsupervisory salaries for the CMO labor costs by FE function and the CPO grade increase determinations computed for the consolidated organization labor costs.

In addition to the above staffing level determinations, the consolidated recurring staffing requirement can be used to determine the consolidated organization contracting capability. This will allow evaluation of contracting the nonrecurring workload.

#### *CMO Manpower Costs*

As discussed in Chapter 5, the recognized staffing level is not an appropriate measure to evaluate the work actually accomplished under the CMO. The CMO workload was accomplished by the on-board manpower, which

\*The in-house functions include all related FE functions; installation support functions are covered in a separate section.



is the staffing level at which the cost comparison should be made. Adjustments to the combined on-board staffing level must be made to avoid inaccurate cost determinations. These adjustments may include increased or decreased manpower requirements for new or phased-out programs as determined by Staffing Guide criteria. For example, IFS is a new program which is required by the Staffing Guide criteria but may not be included within the FE CMO. To appropriately compare the CMO to the consolidated organization, the IFS manpower requirement must be added to the CMO. Man-year computations derived from the Staffing Guide criteria are shown in Figure 23. The additional CMO IFS man-year requirement can be presented as shown in Figure 36. The manpower cost requirements for the CMO on-board staffing level can then be developed using the following procedures and format.

Yardstick Code	FE Function	FE CMO Total	Additional FE(CMO) IFS	Adjusted CMO Total
<u>IFS Man-years:</u>				
612.4	Est. Fac. Inspection			
612.5	IE Mgmt. Serv. and Tech. Asst.			
<hr/>				
	Total Man-years			
<u>IFS Man-years Cost:</u>				
612.4	Est. Fac. Inspection			
612.5	IE Mgmt. Serv. and Tech. Asst.			
<hr/>				
	Total Cost (w/fringe)			

Figure 36. Determination of IFS staffing for FE organization (CMO).

CMO Manpower Cost Determination Procedures. FE in-house manpower costs are computed using the average salary cost of nonsupervisory and supervisory personnel for each RPMA function. It is important to note that each FE function will have different average nonsupervisory and supervisory salaries (including fringe benefits and premium pay). The manpower costs are determined by multiplying the average salary factor,

as shown in Figure 13, times the respective FE on-board staffing levels, as shown in Figure 9. The IFS requirements should be added, if applicable.

The total CMO on-board constructed manpower cost requirements should be compared to the recorded total base year labor expenditures. Differences of less than 5 percent may be attributable to employees' within-grade and/or step increases (exclude the additional IFS requirement for this comparison). When a greater than 5 percent difference is computed, the data collection and computation process should be re-evaluated for possible error.

CMO Manpower Cost Presentation Format. The combined on-board base year manpower costs can be presented in the format provided for the CMO/consolidated organization manpower cost comparison in Figure 37.

#### *Consolidated Organization Manpower Costs*

The basis for labor comparison, as identified in Chapter 5, is the RPMA accomplished by the combined CMO on-board manpower during the base year period. The estimated consolidated organization on-board staffing level calculated by the Staffing Guide is added to the on-board staffing level for LA-staffed functions. The following procedures and format should be used to identify the consolidated manpower costs.

Manpower Cost Determination Procedures. Nonsupervisory and supervisory manpower costs must be determined for the consolidated staffing level entitled accomplished without backlog and overtime (Figure 23). Nonsupervisory manpower costs are calculated by multiplying the average FE nonsupervisory salaries from Figure 13 times the average number of nonsupervisory positions from Figure 23. Supervisory manpower costs are calculated by multiplying the average supervisory salaries from Figure 25 times the average number of supervisory positions from Figure 23. Nonsupervisory and supervisory costs are then summed by FE function for comparison to the respective CMO on-board manpower costs.

Manpower Cost Presentation Format. The accomplished without backlog and overtime consolidated manpower cost requirements should be presented in the format provided for the CMO/consolidated organization manpower cost comparison in Figure 37. An organization chart should be prepared to show the affected positions.

#### *CMO/Consolidated FE In-House Manpower Cost Requirements*

CMO/consolidated FE in-house manpower cost requirements should be summarized for comparison in the format shown in Figure 38. The cost factors to be presented are categorized by CMO/consolidated including total man-years, manpower costs, and a reference source within this procedural guide. Employee fringe, leave and premium pay percentages should be included within the total manpower cost computations for CMO/consolidated cost comparison.



*Estimated Consolidated Contracted Cost*

In addition to calculating the recognized and on-board consolidated staffing requirements, the FE in-house manpower requirements to accomplish the recurring work should be identified to permit evaluation of the feasibility of contracting all nonrecurring work. Reduction of the FE in-house work force by the widespread use of contract labor must be compared to the costs of contracted FE services and FE in-house administrative manpower costs necessary to accommodate the additional contracting workload.

Organization	Man-Years	Cost	Reference Figure No.
<u>CMO (On-Board Staffing Level):</u>			
With Fire Dept.*			9
Without Fire Dept.*			10
<u>Consolidated (Accomplished Without Backlog and Overtime):</u>			
With Fire Dept.*			23
Without Fire Dept.*			24

\*If applicable

Figure 38. CMO/consolidated FE in-house manpower requirements.

Two areas must be examined to identify the contracted manpower cost for the consolidated organization: the base year RPMA contract expenditure and the nonrecurring estimated contract cost predictions. The total dollar values of contracts let during the base year period by the FE and BCE should be combined to obtain the base year contract expenditures. To project the cost of contracting the nonrecurring work, three major cost elements must be examined.

1. Labor. An estimate of the direct labor portion of the contract cost of total nonrecurring base year manhours (accomplished and unaccomplished RPMA workload requirements) can be computed by multiplying the nonrecurring workload by the respective consolidated organization shop rate.

2. Materials. Material and/or supply costs to the contractor can be estimated from a comparison of the existing respective shop percentage of material utilization to the identified labor. The material associated with nonrecurring manhours can be projected.

3. Overhead. A cost for the contractor's overhead can be determined based on historical information from base procurement personnel, FE engineering services staff, and local contractors. The percentage attributable to the contractor's overhead times the total labor and material costs will provide an estimate of overhead cost to the consolidated organization.

The contract estimate for the nonrecurring RPMA workload will equal the sum of the costs of labor, material, and overhead. These computations can be presented as shown in Figure 39.

#### Installation Support Comparative Analysis

Three alternatives for providing the consolidated organization with the functions currently performed by the installation support agencies are available: (1) in-house performance, (2) host installation support, and (3) commercial services contracts. These alternatives must be evaluated and compared to determine the greatest efficiencies and economies. It may be obvious and easily proven that certain support functions will not be feasibly performed in-house by the consolidated organization. Examples of functions which require costly equipment not likely to be justified by the consolidated organization are computers, telephone systems, and printing equipment. To determine which alternatives are the most feasible, the combined CMO data for each installation support agency described in Chapter 4 should be compared to the consolidation data for each alternative developed in Chapter 5. By subtracting the alternatives from the combined CMO, the differentials can be compared to determine which alternatives provide the greatest potential savings. The consolidated installation support analysis can be presented as shown in Figure 40.

After calculating the most economical alternative, the savings resulting from consolidating the installation support must be determined. Since the savings are theoretical, a range should be determined to establish the lowest and highest expected savings. Each alternative chosen will have a minimum and maximum requirement in man-years and personnel costs for consolidation staffing. The minimum requirement is the estimated man-years of support for the FE/BCE and the maximum requirement is the minimum requirement plus the man-years retained by the installation agencies. By subtracting the minimum and maximum requirements from the combined CMO, the maximum and minimum savings can be determined for each function. Totaling the maximum and minimum savings differentials will produce the range of manpower savings due to consolidating installation support for the consolidated organization.



<u>Yardstick Code</u>	<u>Shop #/FE Organization</u>	<u>NR Manhours</u>		<u>Total</u>	<u>Shop</u>	<u>Labor Cost</u>	<u>Supply</u>	<u>Contractors</u>	<u>Total Costs</u>
		<u>Accomplished</u>	<u>Unaccomplished</u>	<u>NR Mh</u>	<u>Rate</u>	<u>of NR Work</u>	<u>Costs*</u>	<u>Overhead Cost</u>	

PART I - BUILDINGS AND GROUNDS DIVISION

PART II - UTILITIES DIVISION

TOTALS

\*Compute costs by utilization percentage of respective craft/shop.

Figure 39. Quantity and cost of nonrecurring (NR) work.

Current Method of Operation				Alternative Consolidated with Army Providing Support					
Ydstk Code	Function	Man-Years of Support a	Personnel Cost b	Man-Years Required by Army c	Personnel Cost d	Man-Years Retained by Air Force e	Personnel Cost f	Total Man-Years g(c+e)	Total Personnel Cost h(d+f)
60	MISO/Data Automation								
100	Comptroller Installation FE/Budg. Acct. Stat BCE/Budg. Acct. Stat TOTAL								
220	AG/Base Administration								
270	Civilian Personnel Installation Support TOTAL								
520	Supply Installation FE/Supply BCE/Supply TOTAL								
530	Procurement Trans/Movmts Br (562) TOTAL								
560	Transportation Div								
570	Material Maint Div								
700	Communications								
	TOTAL								

Figure 40. Example of consolidated installation support analysis.

Alternative Consolidated Organization Providing Partial Support												
Ydstk Code	Function	IFO	Man-Years	Personnel	Man-Years	Personnel	Total	Personnel	Total	Man-Years	Cost	Differential
		Man-Years Cost i	Retained by Army k	Cost j	Retained by Air Force m	Cost n	Man-Years Cost o(i+k+m)	Cost p(j+l+n)	Man-Years Savings q(a-g)	Cost Savings r(b-h)	Man-Years Savings s(a-o)	Cost Savings t(b-p)
60	MISO/Data Automation											
100	Comptroller Installation FE/Budg. Acct. Stat BCE/Budg. Acct. Stat TOTAL											
220	AG/Base Administration											
270	Civilian Personnel Installation Support TOTAL											
520	Supply Installation FE/Supply BCE/Supply TOTAL											
530	Procurement Trans/Movmts Br (562) TOTAL											
560	Transportation Div											
570	Material Maint Div											
700	Communications											
	TOTAL											

Figure 40. (Cont'd).

The manpower should be identified as administrative staff or direct labor to facilitate determination of the total manpower savings. The consolidated support comparison can be presented as shown in Figure 41.

The "other" installation support costs for the CMO and consolidated organization must also be compared by subtracting the consolidated other costs from the CMO other costs. If the difference is positive, then there is an additional savings due to consolidation. These results should be documented.

#### Total Manpower Summary

The total manpower requirement is broken into four major categories: (1) installation support manpower, (2) FE in-house manpower (without fire department), (3) activity civil engineer (for AIFO evaluation), and (4) installation residual engineering organization. The manpower savings due to consolidation are calculated by comparing the consolidated staffing with the CMO staffing. The manpower in each category is identified in man-years and cost (basic pay plus fringe and leave) for the administrative staff and direct labor. The fringe and leave rates are calculated as percentages of the basic pay using the rates established for the CMO. Compensatory leave is included in the leave percentage.

The consolidated staffing is compared to the CMO for both a minimum and maximum requirement. The minimum staffing requirement is the manpower projected for the consolidated organization; the maximum requirement includes the man-years retained by the installation support agencies. Until a manpower analyst establishes the actual man-years the installation support agencies must give up, the savings will be presented as a range between the minimum and maximum. Presenting the savings as a range eliminates the problem of identifying partial man-years during the survey.

By subtracting the minimum and maximum consolidated staffing requirements from the CMO staffing requirement for each category, the maximum and minimum savings in man-years and personnel costs can be identified. Summing the savings for each category will provide a total savings in manpower due to consolidation.

Man-years and cost requirements of the CMO versus the consolidated organization should be summarized and presented as shown in Figure 42, using the following cost elements and data reference sources.

#### *Installation Support Manpower*

The total installation support manpower data from Figure 41 should be presented.

	Current Method of Operation		Consolidated Staffing		Differential (CMO-Consolidated)	
	Total Support		Minimum Requirement		Maximum Savings	
	Man-Years a	Personnel Cost b	Man-Years c	Personnel Cost d	Man-Years Cost g(a-c) h(b-d)	Personnel Cost j(a-e) j(b-f)
<u>Installation Support:</u>						
MISO/Data Automation Admn. Staff						
Comptroller Admn. Staff						
AG/Base Admn. Admn. Staff						
Civilian Personnel Admn. Staff						
Supply Admn. Staff						
Procurement Admn. Staff*						
Transportation Direct Labor						
Material Maint. Div. Direct Labor						
<u>Total Installation Support:</u>						
Admn. Staff						
Direct Labor						
TOTAL						

\* Includes Movements Branch, DIO.

Figure 41. Example of consolidated installation support comparison.



Current Method of Operation		Consolidated Staffing	
Brig and Pope		Minimum Requirement	
Man-years Basic Pay Fringe & Leave Total Cost		Man-years Basic Pay Fringe & Leave Total Cost	
Installation Support:		Maximum Requirement	
Adm Staff		Man-years Basic Pay Fringe & Leave Total Cost	
Direct Labor			
Total			
FE In-House: (w/o Fire Dept)			
DFAE/BEE			
Adm Staff			
Direct Labor			
Total			
Activity/Civil Engineer:			
Adm Staff/Total			
Installation REQ:			
Adm Staff/Total			
Total Man-years & Cost (w/o Fire Dept)			
Adm Staff			
Direct Labor			
Total			
Direct Labor/Adm Staff			
Ratios			
Fire Dept MY & Cost Differential			
Grand Total: (Man-years & Cost Differential with Fire Dept Savings)			

Figure 42. Example of total manpower summary.

Differential (CWO Consolidated)		
Maximum Savings	Man-years	Minimum Savings
Man-years Personnel Cost	Personnel Cost	

Installation Support:

Adm Staff  
Direct Labor  
Total

FE In-House: (w/o Fire Dept)

DFAE/BCE  
Adm Staff  
Direct Labor  
Total

Activity Civil Engineer:

Adm Staff/Total

Installation REO:  
Adm Staff/Total

Total Man-years & Cost (w/o Fire Dept)

Adm Staff  
Direct Labor  
Total

Direct Labor/Adm Staff  
Ratios

Fire Dept MY & Cost Differential

Grand Total: (Man-years & Cost Differential with Fire Dept Savings)

Figure 42. (Cont'd).

#### *FE In-House Manpower (Without Fire Department)*

The FE in-house manpower (without fire department) data from Figure 38 should be used. Adjustments to the FE in-house manpower to remove any duplicative manpower requirements with the installation support manpower must be made before using the figures in Figure 38.

#### *Activity Civil Engineer*

The ACE manpower requirements established in Chapter 5 should be presented. Since the ACE is a consolidation function, it does not exist in the CMO.

#### *Residual Engineering Organization*

The REO requirements established in Chapter 5 should be presented. The REO does not exist in the CMO and is identified only for the consolidated staffing requirement.

#### *Efficiency Evaluation*

One measure of relative efficiency of an FE organization which should be presented is the ratio of the number of direct labor to administrative staff. Comparison of the ratios will indicate the relative productivity of the CMO versus the consolidated organization. The direct labor classification includes both nonsupervisory personnel and foremen of FE shops. Nonsupervisory and supervisory personnel above the shop foremen are classified as administrative staff. The Fire Prevention and Protection Division should not be included in the FE administrative staff total, since it is not dedicated to the support of the FE direct labor, as are the other administrative functions. In addition, at smaller installations, the Fire Prevention and Protection Division can represent a substantial portion of the FE organization. If the fire departments were included in the analysis, the administrative/direct labor ratio would indicate an extremely high number of administrative to direct labor personnel, which could lead to an erroneous indication of the organizational efficiency.

The direct labor cost can also be compared to the administrative staff cost to provide a ratio of the number of direct labor dollars to every administrative staff dollar. The overhead costs decrease as the direct labor/administrative staff ratio increases.

#### *Fire Protection/Prevention*

If the fire departments were analyzed separately, the manpower savings can be added to the total manpower summary to provide a grand total for consolidation.

### Military in the Consolidated Organization

The analysis of the CMO will reveal the number of military personnel in each of the FE organizations involved in consolidation. The assumption for the cost analysis is that the military are included in the consolidated organization at the same civilian/military mix as existed in the CMO. In-house military are not distinguishable from civilian personnel when staffing determinations are calculated using the Staffing Guide. The decision to use the military in the consolidation must be assumed unless the cost analysis study receives other direction. The FE organizations involved in the consolidation action may have very different civilian/military ratios. Two possible options on how to transfer the military to the consolidated organization are presented below:

1. The military could be assigned to the consolidated organization in the same civilian/military mix as presently exists in the CMO.
2. Military assignment to the consolidated organization could be based on a proportional share of each service's workload. A workload ratio for each service could be developed from the base year operating costs. Military could then be assigned to the consolidated organization in this ratio, and each service would receive an equitable amount of the workload accomplished by the military.

The final cost analysis should include the possibility of converting the military spaces to civilian spaces in the consolidated organization. This would require that the military be transferred to other duties or installations. The decision to convert to an all-civilian consolidated organization should be made during the implementation evaluation.

The assumption for this option must be that the savings in man-years due to consolidation will be obtained entirely from the military spaces of the combined organization. The number of civilians that would be required to replace the military can be determined by subtracting the consolidated savings from the total number of military.

The cost of the military-to-civilian conversion can be calculated from the difference between the military and civilian costs. The real cost of the military personnel, including all benefits, training, leave, etc., should be compared to the total cost for civilian personnel. Figure 43 provides an estimate of the military cost prepared by using the *Army Force Planning Cost Handbook*.<sup>34</sup> The cost differential multiplied by the number of civilians required to replace military yields the cost of this option. This cost represents either a reduction in savings available through consolidation, or an increased cost due to consolidation.

<sup>34</sup>*Army Force Planning Cost Handbook* (Directorate of Cost Analysis Office, Comptroller of the Army, June 1976).

		<u>Cost</u>
One-Time Cost		
Recruitment, Physical Exam, Travel		\$1,524
Annual Turnover	39.6%	\$ 604
Annual Recurring Cost		
Average CMO Military Salary		8,529
Installation OMA/Person		3,200
Training, POL, Ammunition		200
PCS		215
Training (MOS 62B)		<u>2,120</u>
	Total	\$13,872

Figure 43. Example of total annual military cost estimation.

The estimated manpower and cost associated with a military-to-civilian conversion should be analyzed in detail by the implementation team. Because of the separate funding of military salaries, the military services may feel that the consolidated organization is not utilizing the military personnel equitably. The training for military in RPMA could be performed at other nonconsolidated organizations. It should be emphasized that any military removed from the consolidation but retained at the installation must not duplicate the functions performed by the consolidated organization.

#### Equipment Analysis

Chapter 5 presented the comparison of the combined CMO and consolidated organization equipment requirements.

To determine the CMO equipment excess and consolidated equipment requirements, a comparison was required between the combined CMO and the consolidate organization in Chapter 5. The results due to consolidation of equipment requirements should be summarized for each equipment type. The total current value for all excess equipment due to consolidation represents the potential one-time savings or cost avoidance. Since the equipment excessed after consolidation may not recover its book value, the equipment can be treated as a cost avoidance.

The constructed consolidated equipment requirement and the CMO inventories should be compared. One method of comparison of SP equipment would be to construct an equipment/direct labor ratio (value of equipment/amount of direct labor) for the CMO and consolidated organization.



Significant differences in equipment requirements between consolidated organization and CMO should be addressed. Accuracy of utilization data has a direct effect on the indicated savings.

### Implementation Analysis

The RPMA consolidation analysis study team should recommend that an implementation evaluation be performed prior to the decision to consolidate and should identify the implementation costs.

### *Implementation Evaluation*

An implementation plan is needed if the cost analysis justifies consolidating the RPMA. Before a final decision is made to consolidate, an implementation evaluation is required to verify the findings in the cost analysis for the base year in light of the current period, resolve the problems associated with consolidating the existing RPMA organizations across service lines, and plan the implementation actions. To successfully evaluate the consolidation requirements, a freeze must be placed on all personnel actions, and organizational changes must be suspended from the start of the verification of the cost analysis until the conversion to the consolidated organization begins. Figure 44 presents a time chart of the implementation period.

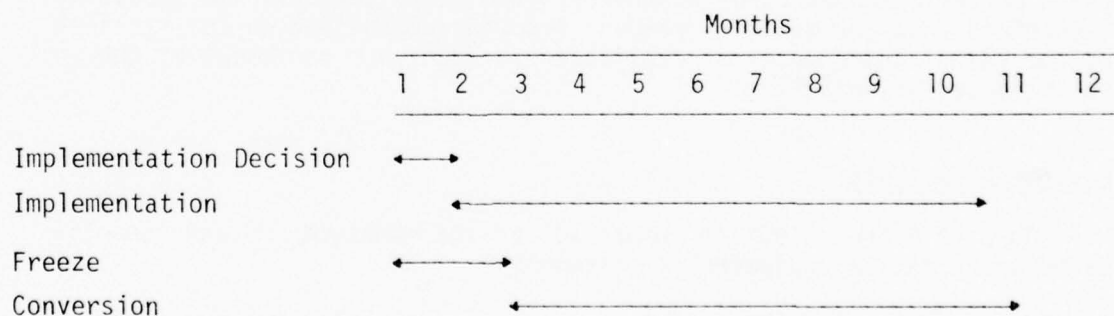


Figure 44. Implementation chart.

The feasibility analysis should recommend that the consolidation decision not be made until the cost analysis has been verified for the current operations, and the problems have been resolved on military manpower participation in the consolidated organization, higher headquarters' location, fire prevention/protection disposition, reporting requirements for the Air Force, Civilian Personnel Office evaluation of manpower requirements for the consolidated organization and installation support agencies, and transferring facilities to the consolidated organization.

### *Implementation Costs*

The cost to convert the existing RPMA organizations into an RPMA consolidated organization must be evaluated. The one-time conversion cost elements include the personnel and activities to establish/organize the consolidated organization, equipment requirements, alterations/modifications to buildings, relocation of personnel/equipment, and severance pay for a reduction-in-force when applicable.

There is an additional cost for the initial operating funds required by the AIFO to start operation. This corpus is not treated as a one-time conversion cost, since it is an advance of funds and is recoverable.

Implementation cost development and respective presentation formats are discussed independently by cost element. The cost development procedures are useful estimating criteria for preliminary cost determination, but the implementation cost must be re-evaluated in detail by the implementation team.

### *Implementation Team Costs*

A team must be formed to establish and organize the consolidated organization so that an orderly transfer of RPMA requirements and facilities can be accomplished. The team leader should be the new director of the consolidated organization. This will help in establishing policies and maintaining continuity between the preconsolidation and postconsolidation activities. The team should also include a skeleton administrative staff for the consolidated organization and representatives from the military services involved and the higher command. The team should have approximately 1 year to handle the preconsolidation activities.

Implementation Cost Development. The preconsolidation activities include the development of reporting requirements, management and financial procedures, job descriptions, user rates, office and shop space allocations, transfer of facilities, communication requirements, property records, etc. The Public Works Center System Branch, Public Works Division, Naval Facilities Engineering Command has gained historical experience from the establishment of Public Work Centers. Because of this factor, the Navy's estimating standard of 2 percent of the gross volume of business (GVB) is recommended for an implementation team cost estimate. The base year CMO costs must be updated to current values to provide a reasonable estimate of the anticipated consolidated organization's GVB. Thus, base year labor, materials/supplies, contracts, and other costs are combined and increased accordingly to reflect salary increases and estimated costs of installation support (whether in-house or reimbursable).

Implementation Team Estimated Cost Presentation Format. Figure 45 provides the format for presenting the projected consolidated organization's GVB and the implementation team cost. Estimated costs are rounded,

Cost Element:	<u>Cost</u>
Installation Support (Reimbursable/In-House)	\$
FY 75 FE/BCE Labor (Includes Fringe)	
15% Labor (Compensation/Leave Percentage for Grade Increase)	
FY 75 Supplies/Contracts/Other (Incl. Inflation Factor)	_____
Projected consolidated organization Gross Volume of Business (GVB)	\$
Implementation Team Cost (2% of GVB)	\$

Figure 45. Estimated implementation team cost.

and an inflation factor<sup>35</sup> from the Building Cost Index is included in the calculations of the supply and contract estimated costs.

#### *Equipment Cost*

Equipment cost may be incurred by new purchases, modifications for system compatibility, and manhours expended in physical inventory of equipment reassigned to the consolidated organization accountable officer. At a minimum, the above cost elements should be considered when evaluating the implementation costs attributable to equipment.

The consolidated equipment analysis is based on the premise that all Army and Air Force FE equipment will be transferred to the consolidated organization. Thus, the implementation cost for consolidating equipment is minimal, barring any requirements for new consolidated organization equipment. The only anticipated equipment cost to the consolidated organization would then be the cost of modifying equipment for consolidated organization system compatibility. This cost element, if applicable, should be estimated by the FE industrial engineering staff for implementation cost determination. The equipment costs should be properly documented and reported.

#### *Space Alterations*

The building and construction costs identified in the consolidated space requirements analysis must be included in the implementation cost

<sup>35</sup>*Staffing Guide for U.S. Army Garrisons*, DA Pam 570-551, Change 4 (Department of the Army, 25 August 1976), Appendix D, Inflation Factor for Directorate of Facilities Engineering Staffing Tables, Building Cost Index (1.163).

requirements. The existing space should be examined in terms of DOD criteria and actual distribution. Requirements of the consolidated organization can then be developed from the CMO. An average of the existing office space per administrative individual times the consolidated administrative staffing level can provide an estimate of consolidated organization requirements. Correspondingly, consolidated organization shop space and storage area requirements can also be developed. The consolidated space requirements should be met by proper utilization of the existing facilities where feasible. Space alterations should be properly documented and reported.

#### *Personnel Relocation Cost*

The relocation costs include the moving of furniture and furnishings necessary to accommodate the reorganization based on the consolidated space analysis.

The CMO FE administrative and direct labor functions should be surveyed to determine the consolidated requirements and to develop an estimate of the essential furniture and furnishings which will be relocated to the consolidated organization. As the FE organization has available manpower and equipment necessary to facilitate such a move, the cost of FE in-house manpower is used to develop the relocation cost estimate. Thus, an average civilian hourly salary times the number of manhours involved in the move is assumed to be an adequate estimating criterion. However, should the capability of FE in-house personnel not be adequate to accommodate the scope of work involved in the relocation, FE out-of-house resources should be contacted for an estimated relocation cost. All costs involved in personnel relocation must be documented.

#### *Severance Pay*

A reduction-in-force (RIF) due to consolidation will cause affected FE/BCE personnel to move, to be placed in another job, to retire, to resign, or to separate (due to declination of a job offer, transfer of function, or placement assistance). The Navy's experience with PWC consolidations has demonstrated a higher than expected early retirement rate and a very low rate of severance pay withdrawals.\* It is not possible to predict how employees will react to the consolidated organization or to predict the success in relocating employees who lose their jobs. Past experience in the DOD Stability of Employment Program<sup>36</sup> indicates that most employees desiring to continue in employment can be

\* Data provided by the Public Works Center System Branch, Public Works Division, Naval Facilities Engineering Command.

<sup>36</sup>Letter, DA DAAG-PAP-A (M) (31 July 74) DACS-DMA, Subject: Installation and Activity Consolidations, Realignments, Reductions and Closures, (8 August 1974).



placed in other jobs. DOD experience indicates 4.5 percent of the affected employees are eligible for severance pay. If an employee does not accept a job which is comparable to his job classification, at the same grade, and within commuting distance, the employee is not eligible for severance pay.

Severance Pay Cost Development. Severance pay is based on age and length of service. For this analysis, the average age and length of service should be used for cost determinations. It is expected that the supervisory personnel who are eliminated will have the most difficulty finding comparable jobs within the new organization. If the military are removed from the consolidated organization, the number of civilian employees will be increased, but the new positions will not be of the right skills and grades to assimilate all those who are subject to the RIF. Thus, a total number of candidates subject to a RIF action should be determined by comparing each consolidated FE yardstick manpower requirement with the CMO combined "on-board" staffing level. Differences resulting in a decreased manpower level for the consolidated organization should be treated as a probable RIF action; increases are to be treated as recruitment actions. Respective FE in-house man-year requirements and FE support man-year requirements are to be evaluated separately, excluding duplicative in-house man-years (i.e., Comptroller, Supply, etc.). The RIF actions resulting from the above computations should then be multiplied by the DOD 4.5 percent severance pay factor to establish the projected personnel eligible for severance pay. Depending on the age and length of service, the local CPO should provide the appropriate number of weeks of severance pay eligibility. The total severance pay cost estimate can be determined by multiplying the average civilian weekly base pay, plus 10 percent, times the number of weeks times the number of probable RIF actions. Severance pay cost computations can be presented with and without the CMO fire departments.

Severance Pay Cost Presentation Formats. The estimated severance pay can be presented using the format in Figure 46 for the FE in-house RIF and that in Figure 47 for the installation support RIF.

#### *IFS/Automated Reporting System(s) Interface Cost*

The cost requirements for adding the needed Air Force or Navy reporting requirements to IFS will be identified as a cost to consolidate RPMA. The estimated cost criteria identified in the consolidated FE computer services support requirements are utilized to develop an IFS/ Automated Reporting System(s) interface cost estimate. The estimated costs should be presented in the final summary format which identifies all implementation cost estimates.

#### *AIF Corpus*

If an AIF is being evaluated, the corpus must be analyzed. The AIF and the separate project cash accounts are revolving funds. Payments



Yardstick Code	FE Function	Consolidated Accomplished Workload w/o Backlog & Overhead*		On-Board Total All FE Organizations**		Differential a-b	
		a		b		a-b	
		Admn. Staff	Direct Labor	Admn. Staff	Direct Labor	RIF	Recruit
TOTALS							

\* This column is obtained from Figure 24, Staffing Guide administrative staff/direct labor manpower requirements  
 \*\* This column is obtained from Figure 10, Comparison of on-board administrative staff to direct labor.

Figure 46. Estimated FE in-house reduction-in-force.

<u>Installation Support Function</u>	<u>Consolidated</u> a	<u>Current Method of Operation</u> b	<u>Differential</u> a - b
			RIF Recruit
MISO/Data Automation			
Comptroller			
AG/Base ADM.			
Civilian Personnel			
Supply			
Procurement			
Transportation			
Material Maint. Div.			

Figure 47. Estimated FE installation support reduction-in-force.

for the cost of manufacturing, assembling, or providing services are made from the industrial fund as authorized by respective installation charters, and reimbursement is made from appropriations or other funds to the industrial fund for goods produced or services rendered. Because the AIF corpus is a revolving fund and services performed are reimbursable after work completion, advance funding for payment of job materials and labor costs prior to industrial fund accruals will be necessary. This cost element is not treated as an implementation cost, since it is recoverable. It is, however, funding that must be made available prior to the beginning of AIFO operations.

The corpus should include enough money for a 60-day operating period; i.e., 60 days of labor funds and 60 days of supplies and/or materials funds. The maximum consolidated man-year requirements (with and without the fire departments) should be multiplied by the average civilian salary for a 2-month period to determine the labor advance funding requirement. To determine the advance funding necessary for supplies and/or materials, a survey of available CMO transfer stock along with a review of preconsolidation approved work order request material needs must be accomplished. PWC guidance may be helpful in development of this estimated stock cost if base year stock requirements are not definable. The corpus cost development should be documented.

### *Consolidation Start-up Costs*

Figure 48 provides the final summary presentation format for identifying all conversion cost elements and related cost estimates.

<u>Cost Element</u>	<u>Estimated Cost</u>
Implementation Team-----	\$
Equipment-----	
Space Alterations-----	
Relocation-----	
Severance Pay-----	
IFS/BEAMS Interface-----	
Total	\$
AIF Corpus (if applicable)	\$

Figure 48. Start-up cost estimate.

### Consolidated Cost Summary Analysis

The consolidated cost summary analysis is performed to determine the feasibility and economical desirability of consolidating RPMA. The cost analysis requires that base year CMO and consolidated maximum and minimum man-year and cost differentials be constructed with and without the fire departments (if applicable). The fire prevention/protection consolidation analysis may be included from a separate study of the fire departments. Development of the appropriate cost data to be analyzed and the appropriate presentation format to be used in the consolidated cost analysis are identified within this section.

#### *Development of CMO/Consolidation Comparative Cost Categories*

Annual Savings. The annual cost savings due to consolidation have been identified for manpower and "other costs." Figure 42 provides the total manpower savings in man-years and personnel costs for both maximum and minimum savings. Added to this manpower savings is the total savings for other costs identified in the installation support comparative analysis. Total consolidated annual savings represent the total CMO/consolidation cost difference of labor plus support "other costs."

One-Time Cost. Two cost categories are identified: (1) implementation cost due to RPMA consolidation (Figure 48), and (2) equipment cost avoidance identified above. The equipment cost avoidance is subtracted from the implementation costs because it is a one-time reduction in equipment requirements and the implementation cost is a one-time increase.

Payoff Period (Cost/Annual Savings). The consolidated payoff period is calculated by dividing the one-time cost total by the total annual savings to determine the duration of the payoff period (measured in years).

FE Operating Cost (CMO). FE operating costs for the CMO are constructed to include all related FE in-house and installation support cost elements. The CMO operating cost is needed to determine the percent of savings the consolidation action would achieve. Operating costs for the CMO base-year period are constructed using the following criteria:

FE Operation Costs/CMO (With Fire Department)  
FE/BCE (includes fringe and leave except Compens.)-----  
Compensation ( \_ percent of combined labor cost)-----  
New Program (IFS man-year cost with benefits)-----

Installation Support CMO Costs  
Labor plus fringe and leave-----  
Other Costs-----  
Total-----

FE Operation Costs/CMO (Without Fire Department)  
FE/BCE-----  
Compensation ( \_ percent of combined labor costs)-----  
New Program (IFS man-year with benefits)-----  
IFS (man-year cost with benefits)-----  
Installation Support CMO Costs  
Labor plus fringe and leave-----  
Other Costs-----  
Total-----

Annual Savings/FE Operating Cost (CMO). The consolidated annual savings are divided by the FE operating cost to determine the percentage of consolidated annual savings.

FE Labor Cost (CMO). FE labor costs for the CMO are constructed to include all related FE in-house labor and installation support cost elements. The labor costs are required to establish the percent of savings in personnel costs due to consolidation. CMO labor costs are constructed using the following criteria:

FE Labor Costs/CMO (With Fire Department)  
FE/BCE (Includes fringe and leave except compens.)-----  
Compensation( \_ percent of combined labor)-----  
New Program (IFS man-years with benefits)-----  
Installation Support CMO Costs  
Labor plus fringe and leave-----  
Total-----

FE Labor Costs/CMO (Without Fire Department)	
FE/BCE (Includes fringe and leave except compens.)-----	
Compensation ( _ percent of combined labor)-----	
New Program (IFS man-year cost with benefits)-----	
IFS (man-year cost with benefits)-----	
Installation Support CMO costs	
Labor plus fringe and leave-----	
Total-----	

Labor Savings/FE Labor Cost (CMO). The consolidated labor savings (identified as one of the cost elements used to determine annual savings) are divided by the CMO FE labor costs to determine the consolidated labor savings percentage.

#### *Consolidated Cost Summary Analysis Presentation Format*

The consolidated cost analysis developed from the above criteria should be presented in the format shown in Figure 49. Maximum and minimum manpower and cost differences due to RPMA consolidation are recorded with and without the fire departments (if applicable).

#### DA Requirements

DA will provide additional guidance to the DA Letter, subject: Installation and Activity Consolidations, Realignment, and Closures<sup>37</sup> specifying the requirements to be completed by the LDODRPMCC.

#### Environmental Impact Assessment

The reduction in personnel due to consolidation of RPMA will require an Environmental Impact Assessment (EIA) in accordance with Army regulations.<sup>38</sup> The effects of consolidation on the local economy must be evaluated to determine the socioeconomic impact. The EIA must evaluate the impact of the change in such factors as business volume, personal income, housing, schools, and taxes. The military and civilian personnel spend and save a portion of their income in the local community which, in turn, generates more jobs and income. They require local utilities, libraries, schools, and police/fire protection which may be affected by major changes in employment.

<sup>37</sup>Letter, DA, DAAG-PAP-A (M) (31 Jul 74) DACS-DMA, Subject: Installation and Activity Consolidations, Realignments, Reductions and Closures, (8 August 1974).

<sup>38</sup>*Environmental Quality: Environmental Protection and Enhancement*, AR 200-1, Changes 1 and 2 (Department of the Army, 14 November 1975).



Annual Savings	Maximum Savings				Minimum Savings			
	Without Fire Department		With Fire Department		Without Fire Department		With Fire Department	
Labor	Man-Years	Cost	Years	Percent	Man-Years	Cost	Years	Percent
Support "Other Cost"								
Total Annual Savings								
One Time Cost								
Implementation Cost								
Equipment Cost Avoidance								
Total								
Payoff Period (Cost/Annual Savings)								
Base Year Operating Cost								
Annual Savings/Base Year Operations Cost								
Base Year Labor Cost								
Labor Savings/Base Year Labor Cost								

Figure 49. Consolidated cost summary analysis.

The development of an EIA is a very complicated and time-consuming project, requiring collection of regional data from the Department of Commerce, Department of Defense, Department of Health, Education, and Welfare, Bureau of the Census, and Bureau of Economic Analysis. The required information has been accumulated and automated for all of CONUS by regional area in the Environmental Technical Information System (ETIS) developed by the U.S. Army Construction Engineering Research Laboratory (CERL).

The part of ETIS which will provide the data necessary to evaluate the consolidation of FE organizations is the Economic Impact Forecast System (EIFS), which provides quantitative estimates of the economic impacts of an action.<sup>39</sup> This system will estimate the impact of changes in expenditures at military installations on local business, households, and governments in the areas of employment, personal income, total business volume, housing revenues, housing and business investments, and government expenses.

EIFS is operational on a PDP 1150 mini-computer maintained and operated by the University of Illinois Center for Advanced Computation (CAC) at Urbana, IL. The interactive, or remote terminal, aspects of EIFS make the system available at many locations. If the system cannot be directly accessed, CERL or the major command (MACOM) environmental office can provide the EIFS output if the pertinent data are supplied.

Consolidation of RPMA is a mission change for the involved installations. Mission change is one of the functional areas in which EIFS can provide socioeconomic data and estimates using a minimal amount of information supplied by the user. The regional area must be selected; the most pertinent counties may be specified. The user must provide the increase or decrease in civilian and military personnel and the average yearly income for each category. The percent of military personnel housed on the installation and the dollar amount increase or decrease of supplies and services to be purchased locally must also be supplied.

EIFS output is a tool to aid in determining the environmental impact of the proposed changes; it is not an absolute prediction. The user must evaluate the data retrieved from the system and determine whether further environmental impact evaluation is needed. The EIFS may be used as many times as required to evaluate the possible combinations of military personnel changes, civilian personnel changes, and supplies and services.

The EIFS provides three separate sections of output for the EIA. The first section provides the baseline descriptive information for the

<sup>39</sup>R. D. Webster, et al., *The Economic Impact Forecast System: Description and User Instruction*, Technical Report N-2/ADA2027139 (CERL, June 1976).

area. The baseline data are statistics for the region, including size of area, total population, business volume, population by age/sex, employment by industry, total income for the past 10 years, and employment versus population for the past 10 years.

The second section is the Rationale Threshold Values (RTV), which evaluate the elasticity of historical fluctuations. The measure of the normal fluctuations in business volume, personal income, total employment, and population is provided by the RTV.

The third section is the Mission Change Economic Impact Forecast, which evaluates the proposed change's (with historic data) effect on the economy. The changes in the business volume, local personal income, and local employment are provided in percentages which can be compared to the RTV. If the percent of change is between the negative and positive RTVs, the proposed changes are not significant, since this range for the RTV represents the expected maximum and minimum change which is normal for the region.

If the changes are controversial or significant, further study is required and an Environmental Impact Statement should be prepared. If the economic impact is insignificant, the EIA should be included in the study report to document that the environmental aspects of consolidation were evaluated.

## 7 CONCLUSION

The general procedures presented in this report will provide assistance in performing a cost analysis of RPMA consolidation and identifying DA requirements to accompany such studies. The procedures are designed for consolidation actions between the Army and Air Force, but the general approach is applicable to Army/Navy consolidations as well. Each consolidation location is different and will involve some variations from the identified procedures. Thus, the procedures should be used as a guide and modified as required.

APPENDIX A:  
RPMA CONSOLIDATION STUDY PLAN

References - Identify the directives, memoranda, letters, etc. which provide background information relating to the proposed RPMA study.

Purpose - Explain what the study is to develop and accomplish.

Terms of Reference

*Problem.* State what is to be evaluated.

*Impact of Problem.* Explain what the identifiable consequences and requirements implicit in this problem should be.

*Objectives.* List the objectives to be developed and accomplished from this proposed study.

*Limits.* Give the boundaries to be utilized for this study's alternatives, options, methodology, and analysis.

*Scope.* Define the scope of the proposed study.

*Assumptions.* Explain the assumptions which must be made at the outset of the proposed study to accomplish the objectives.

*Essential Elements of Analysis (EEA).* List the elements that the analysis must address and answer to accomplish the objectives.

*Environment.* State the area(s) in which the proposed study will impact the environment.

*Constraints.* Define the constraints that limit the study by laws, regulations, directives, etc.

*Methodology.* Describe the process to accomplish this study, including different phases and tasks.

*Measures of Effectiveness.* List the factors by which the study will be evaluated for effectiveness.

*Related Studies.* List previous and on-going studies solving the same problem.

*Support and Resource Requirements.* State the support and resources which will be required to meet the objectives of the study.

*Higher Headquarters Support.* State the support which will be required from higher headquarters and the installation to provide the required data, information, review, etc.



*Consolidation Study Resources.* Identify the direct and indirect manpower resources which will be required at all levels to accomplish the study objectives.

Administration - Identify the planned activities with estimated completion dates. Emphasize the identification and time frame for major milestones throughout the study in order to meet the study's completion date.

## APPENDIX B: AUTOMATED STAFFING GUIDE PROGRAM

Determination of manpower requirements manually using the Staffing Guide (DA Pam 570-551) criteria is a complicated and time-consuming task. The Engineer Studies Group, Office of the Chief of Engineers, Department of the Army, has developed an Automated Staffing Guide Program (ASGP)<sup>40</sup> to be used in determining the manpower requirements defined in the Staffing Guide. The ASGP user's manual contains a source listing, a description of the data inputs, and a discussion of the structuring mechanism behind the program. This program was developed and implemented on the Mathematics and Computation Laboratory's UNIVAC 1108 (under GSA).

The program requires input of the yardstick table data and the respective base year workload data as defined in the Staffing Guide. The program has also been modified to receive nonsupervisory and supervisory cost input data, by yardstick, for manpower cost determinations.\* Prior to actual data input, preparation of the command structure is required. The command structure is the most difficult, yet the most important input preparation. The command structure is defined as a dependency network of yardstick table and workload data. To complete the command structuring, assistance from the Engineer Studies Group may be required, although the user's manual does provide the basic elements necessary for preparation of the command structure as well as a description of other input data requirements.

It is important to evaluate the cost of using the computer system and time factors involved in setting up the necessary data for input into the ASGP. However, once the initial input has been made, the overall influence within the organizational structure of workload data changes entered into the Staffing Guide computer system is immediately retrieveable. Workload data changes are likely to occur at any time; whenever they do occur, manpower determinations that build on the change will also be affected. Performing this task manually is a laborious exercise. The ASGP provides the option of analyzing other staffing alternatives in less time than the initial data input requires, since only the relevant workload data require alteration.

<sup>40</sup>G. E. Cooper and K. R. Parker, *Automated Staffing Guide Program: User's/Programmer's Documentation* (Engineer Studies Group, Office of the Chief of Engineers, Department of the Army, April 1976).

\* The ASGP user's manual does not provide details on manpower cost data input; however, the Engineer Studies Group does have the capability and necessary resources available to provide cost data input instructions to an ASGP user.

The ASGP output will provide manpower requirements and manpower cost determinations for each functional level of the FE organization. The ASGP will save considerable time when analyzing more than one staffing structure.

## LIST OF ABBREVIATIONS

AAA:	Army Audit Agency
ACE:	Activity Civil Engineer
AG:	Adjutant General
AIF[O]:	Army Industrial Fund [Organization]
AMS:	Army Management System
ASGP:	Automated Staffing Guide Program
AUTOVON:	Automatic Voice Network
BCE:	Base Civil Engineering Organization, Air Force
BEAMS:	Base Engineer Automated Management System
CERL:	U.S. Army Construction Engineering Research Laboratory
CMO:	Current Method of Operation
CPO:	Civilian Personnel Office
DA:	Department of the Army
DAEN:	Office, Chief of Engineers, HQDA
DAEN-FEM:	Directorate of Facilities Engineering, Management and Systems Division
DAEN-FEP:	Directorate of Facilities Engineering, Office of Plans and Policy
DAEN-RDM:	Research and Development Office, Military Programs
DARCOM:	U.S. Army Development and Readiness Command
DASD (I&H)	Deputy Assistant Secretary of Defense (Installations and Housing)
DIO:	Directorate of Industrial Operations
DMA:	Daily Manhour Average
DOD:	Department of Defense
DODRPMCC:	Department of Defense Real Property Maintenance Consolidation Committee
DSC:	Defense Supply Center
EEA:	Essential Elements of Analysis
EEIC:	Element of Expense/Investment Account Codes
EIA:	Environmental Impact Assessment
EIFS:	Economic Impact Forecast System
EPS:	Engineered Performance Standards
FAST:	Fast Action Service Technique
FE:	Directorate of Facilities Engineering
FORSCOM:	U.S. Army Forces Command
GP:	General Purpose
GVB:	Gross Volume of Business
HQDA:	Headquarters Department of the Army
IFO:	Industrial Fund Organization
IFS:	Integrated Facilities System
IGBL:	Inbound Government Bill of Lading
IJO:	Individual Job Order
ISO:	Installation Supply Office
ISSA:	Interservice Support Agreement
IWP:	In-Service Work Plan
JOR:	Job Order Request
LA:	Local Appraisal

# LIST OF ABBREVIATIONS (Cont'd)

LDODRPMCC:	Local Department of Defense Real Property Maintenance Consolidation Committee
LUC:	Labor Utilization Code
MACOM:	Major Command
MISO:	Management Information Systems Office
MMD:	Material Maintenance Division
MY:	Man-years
NSN:	National Stock Number
OCE (DAEN)	Office of the Chief of Engineers (Department of the Army)
O&M	Operations and Maintenance
Prime BEEF:	Base Engineering Emergency Force, Air Force
PWC:	Navy Public Works Center
PWD:	Public Works Department
QMAD:	Quarterly Manpower Authorization Document
RC/CC:	Responsibility Center/Cost Center, Air Force
REO:	Residual Engineering Organization
RIF:	Reduction-in-Force
RPMA:	Real Property Maintenance Activities
RTV:	Rationale Threshold Values
SO:	Service Order
SOO:	Standing Operation Order
SP:	Special Purpose
TMP:	Transportation Motor Pool
UDL:	Unit Detail Listing
VIMS:	Vehicle Integrated Management System
WATS:	Wide Area Telephone Service
WMS:	Work Management System



## GLOSSARY

Activity Civil Engineer (ACE): An AIFO in-house customer representative for the REO and nonappropriated organizations.

Army Industrial Fund [Organization] (AIF[O]): System where a pool of cash and assets is appropriated when the fund is established. Work is performed using the assets and cash of the fund, and then the fund is reimbursed by the benefiting agency in an amount equal to the total cost of the work.

Authorized Staffing: Staffing level approved by the installation commander.

Automatic Voice Network (AUTOVON): System used to place long distance telephone calls.

Available Manhours: Total manhours available for work order activity.

Backlog: Work not accomplished at the end of a base period.

Base Civil Engineering (BCE): The facilities engineering organization on an Air Force installation.

Base Engineer Automated Management System (BEAMS): An automated data processing system which assists the Base Civil Engineer in the management of the facilities on an Air Force installation.

Base-Line Year: Year used as a base for comparing costs of consolidation proposals with the current method of operation.

Civilian Personnel Office (CPO): Office which provides support, including recruitment and placement, employee relations, union relations, training, processing of personnel actions, and maintenance of personnel records.

Current Method of Operation (CMO): A summation reflecting the combined efforts of the Army and the Air Force real property maintenance activities as they are currently operating.

Director of Industrial Operations (DIO): Organization responsible for installation operation, including support, supply, procurement, and transportation on an Army installation.

Facilities Engineer (FE): A principal staff officer reporting directly to the installation commander and responsible for the overall planning organization, control, and accomplishment of all facilities engineering work on an installation.

## GLOSSARY (Cont'd)

Facilities Engineering Organization: General term used to identify an RPMA organization.

Fast Action Service Technique (FAST): An Air Force technique for scheduling small urgent (but not emergency) work requests by job order. Normally, FAST jobs do not exceed 2 manhours per craft and are accomplished within 5 days.

Hopper Technique: An Air Force technique for the scheduling of small work orders, which are not urgent and are not referred to Programs for IWP processing, by holding the work orders in hoppers representing geographical areas of the installation. Hopper jobs are normally accomplished within 30 days.

Individual Job Order (IJO): An army job order consisting of maintenance, repair, and/or minor construction requirements which exceed the scope of Service Orders.

In-Service Work Plan (IWP): Work which is processed through the Air Force Programs Office, as opposed to work which is received, consolidated, estimated, scheduled, and accomplished all within the Operations and Maintenance function.

Integrated Facilities System (IFS): A multi-command Automated Data Processing-supported facilities management information system which will be implemented at U.S. Army installations CONUS-wide, in Alaska, Hawaii, Puerto Rico, and Panama.

Interservice Support Agreement (ISSA): An agreement between two agencies to render services to each other.

Job Order Request (JOR): A document used by Army installation activities to request accomplishment of work by the Directorate of Facilities Engineering if the work exceeds the scope of Service Orders.

Labor Utilization Code (LUC): Code used to identify the types of direct and indirect work performed by the work force.

Line Item: One item of supply which is received, shipped, or issued, and such receipt, shipment, or issue results in a change in accountability.

Local Appraisal: An analysis of manpower requirements at a locality by manpower survey teams.

Management Information Systems Office (MISO): The office which provides computer support to the Directorate of Facilities Engineering.

## GLOSSARY (Cont'd)

Naval Public Works Center Organization: The facilities engineering organization on a Navy installation.

Nonrecurring Work: Work which is not identifiable in advance and does not occur at regular intervals.

On-Board Staffing: Number of personnel on-board at any given time.

Organizational Concept: Structure of the organization.

Prime BEEF: Teams of military personnel within the Base Civil Engineering function of the Air Force capable of rapid response to emergencies.

Productive Manhours: Total manhours spent in work order activity.

Proposed Staffing: Staffing level proposed by consolidation technique.

Quarterly Manpower Authorization Document (QMAD): Document which assigns military personnel to the Directorate of Facilities Engineering quarterly. QMAD personnel are assigned to perform tasks on a daily basis.

Real Property Maintenance Activities (RPMA): The maintenance function of the real property on an installation.

Recognized Staffing: Staffing level suggested by local appraisal or other technique.

Recurring Work: Work that is identified in advance (in scope) and must be performed at specific repetitive intervals of once a year or more often (except daily), involving facilities, systems, and equipment.

Residual Engineering Organization (REO): Office created to channel work to the AIFO and monitor the progress of the assigned work.

Self-Help Support: Work (other than home owners' responsibilities) performed by military personnel outside of the Facilities Engineering organization on their assigned real property facilities.

Service Order (SO): A minor maintenance job on an Army facility with maximum limitations of 16 man-hours and \$350 total cost.

Shop Rate: Total shop cost per available man-hour.

## GLOSSARY (Cont'd)

Standing Operations Order (SOO): Operations, services, and routine maintenance (including preventive maintenance) on Army installations where the specific work and manpower requirements are relatively constant and predictable in advance, occurring at repetitive intervals of 1 year or less.

U.S. Army Construction Engineering Research Laboratory (CERL): Army research organization charged with the task of performing an economic analysis of the consolidation of real property maintenance activities of Fort Bragg and Pope AFB in the Fayetteville, NC area.

Wide Area Telephone Service (WATS): A system for placing long distance telephone calls.

Work Management System (WMS): The means of accomplishment of the operations and maintenance of the facilities on an installation.

Yardstick: Standard.



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